Installation and Service instructions

DHP-H Opti Pro, DHP-H, DHP-C, DHP-L, DHP-A, DHP-AL

VMBMA502

If these instructions are not followed during installation, operation and maintenance, Danfoss AS's liability according to the applicable warranty is not binding.

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Installation instructions

1 Important information/Safety regulations

⚠ The heat pump must be installed by authorised installation engineers and the installation must follow the applicable local rules and regulations as well as these installation instructions.

⚠ This apparatus is not intended for persons (including children) with reduced physical, sensory or psychological capacity, or who do not have knowledge or experience, unless supervised or they have received instructions on how the apparatus functions from a safety qualified person.

⚠ Children are not permitted to play with the apparatus.

⚠ The heat pump must be located in a frost-free environment!

⚠ The heat pump must be placed in an area with a floor drain.

⚠ The heat pump must be located on a stable base. The base must be able to support the gross weight of the heat pump when filled. (see section 2.10 Recommended location)

NOTE! To prevent leaks ensure that there are no stresses in the connecting pipes!

NOTE! It is important that the heating system is completely bled after installation.

NOTE! Bleed valves must be installed where necessary.

- Installation must be carried out in accordance with applicable local rules and regulations. The hot water tank must be equipped with an approved safety valve (supplied).
- Radiator systems with a closed expansion tank must also be equipped with an approved pressure gauge and safety valve, minimum DN 20, for a maximum 1.5 bar opening pressure, or according to country specific requirements.
- Cold and hot water pipes and overflow pipes from safety valves must be made of heat resistant and corrosion-resistant material, e.g. copper. The safety valve overflow pipes must have an open connection to the drain and visibly flow into this in a frost-free environment.
- The connecting pipe between the expansion tank and the safety valve must slope continuously upwards. A continuous upwards slope means that the pipe must not slope downwards from the horizontal at any point.
- If there is any risk of groundwater infiltration at brine pipe lead-ins, watertight grommets must be used, for more information see section "Drilling holes for brine pipes".
- In addition to applicable local rules and regulations the installation should be carried out in a manner that prevents vibrations from the heat pump being transmitted into the house causing noise.

1.1 Refrigerant

⚠ **Work on the refrigerant circuit must only be carried out by a certified engineer!**

Although the heat pump cooling system (refrigerant circuit) is filled with a chlorine-free and environmentally-approved refrigerant that will not affect the ozone layer, work on this system may only be carried out by authorized persons.

Fire risk

The refrigerant is not combustible or explosive in normal conditions.

Toxicity

In normal use and normal conditions the refrigerant has low toxicity. However, although the toxicity of the refrigerant is low, it can cause injury (or be highly dangerous) in abnormal circumstances or where deliberately abused. Refrigerant vapour is heavier than air and, in enclosed spaces below the level of a door for example, and in the event of leakage, concentrations can arise with a resultant risk of suffocation due to a lack of oxygen. Spaces in which heavy vapour can collect below the level of the air must therefore be well ventilated.

Refrigerant exposed to a naked flame creates a poisonous irritating gas. This gas can be detected by its odour even at concentrations below its permitted levels. Evacuate the area until it has been sufficiently ventilated.

Anyone with symptoms of poisoning from the vapour must immediately move or be moved into the fresh air.

Work on the refrigerant circuit

When repairing the refrigerant circuit, the refrigerant must not be released from the heat pump – it must be destroyed at a special plant. Draining and refilling must only be carried out using new refrigerant (for the amount of refrigerant see manufacturer's plate) through the service valves. All warranties from Danfoss AS are void if, when filling with refrigerant other than Danfoss recommended refrigerant, it has not been notified in writing that the new refrigerant is an approved replacement refrigerant together with other remedies.

Scrapping

When the heat pump is to be scrapped the refrigerant must be extracted for destruction. Local rules and regulations related to the disposal of refrigerant must be followed.

1.2 Electrical connection

Electrical installation may only be carried out by an authorized electrician and must follow applicable local and national regulations.

⚠ The electrical installation must be carried out using permanently routed cables. It must be possible to isolate the power supply using an all-pole circuit breaker with a minimum contact gap of 3 mm. (The maximum load for externally connected units is 2A).

⚠ **Electrical current!** The terminal blocks are live and can be highly dangerous due to the risk of electric shock. The power supply must be isolated before electrical installation is started. The heat pump is connected internally at the factory, for this reason electrical installation consists mainly of the connection of the power supply.

⚠ **NOTE! The room temperature sensor is connected to a safety extra-low voltage.**

Follow the separate installation instructions for the room temperature sensor!

1.3 Commissioning

⚠ The installation may only be commissioned if the heating system, water heater and brine system have been filled and bled. Otherwise the circulation pumps can be damaged.

⚠ If the installation is only to be run on auxiliary heating, first ensure that the heating system is filled and that neither the brine pump nor the compressor can be started. This is carried out by setting the operating mode to ADD.HEAT.

1.4 Control and safety devices

To ensure a correct function of the heat pump there are a number of control and safety devices.

The figure below shows the heat pump's three liquid circuits with respective safety function.

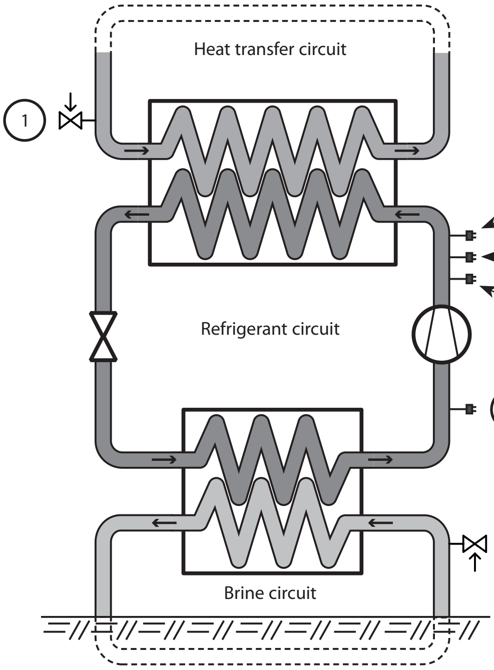


Figure 1: Control and safety devices.

Position	*Name*
1	Safety valve, heat transfer circuit
2	Pressure switch, operation, 2,65 MPa
3	Pressure switch, operation, 2,85 MPa
4	Pressure switch, high pressure, 3,10 MPa
5	Pressure switch, low pressure, 0,08 Mpa
6	Safety valve, brine circuit

Heat transfer circuit

If the pressure in this circuit exceeds the opening pressure of the safety valve (1), the valve opens to release the overflow and then shuts again. The safety valve overflow pipe must have an open connection to the drain and visibly flow into this in a frost-free environment.

Refrigerant circuit

The refrigerant circuit's high pressure side is equipped with a high pressure switch (4) and two operational pressure switches (2,3) (only one is connected). The connected operational pressure switch stops the compressor when the switching point is reached, that is, when sufficient amount of heat is produced.

If the operational pressure switch should fail and the pressure continue to rise, the compressor is stopped by the high pressure switch when its switching point is reached. The operation of the heat pump is blocked. When the problem with the abnormally high pressure is solved, the pressure switch is automatically reset.

If the high pressure switch is tripped the alarm indicator on the front panel is flashing and an alarm text is displayed. Restart the heat pump by first setting the operational mode to OFF and then back to previous mode (AUTO/HEATPUMP/ADD.HEAT/HOT WATER).

The low pressure switch (5) stops the compressor if the pressure is too low on the low pressure side. The operation of the heat pump is blocked. When the problem with the abnormally low pressure is solved, the pressure switch is automatically reset.

If the low pressure switch is tripped the alarm indicator on the front panel is flashing and an alarm text is displayed. Restart the heat pump by first setting the operational mode to OFF and then back to previous mode (AUTO/HEATPUMP/ADD.HEAT/HOT WATER).

Brine circuit

If the pressure in this circuit exceeds the opening pressure of the safety valve (6), the valve opens to release the overflow and then shuts again. The safety valve overflow pipe must have an open connection to the drain and visibly flow into this in a frost-free environment.

Compressor

The compressor is equipped with a thermal overload relay which protects the compressor from over current.

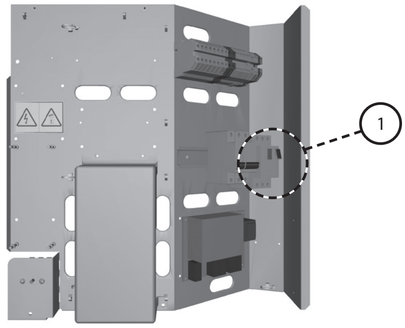


Figure 2: The thermal overload relay on the electrical panel.

Position	*Name*
1	Thermal overload relay (F11)

If the thermal overload relay is tripped the alarm indicator on the front panel is flashing and an alarm text is displayed.

The thermal overload relay must cool down and it is automatically reset. The alarm is acknowledged by setting the operational mode to OFF and then back to previous mode (AUTO/HEATPUMP/ADD. HEAT/HOT WATER).

The compressor is also equipped with an internal protection which stops the compressor's operation if it risks being overheated. The internal protection cannot be reset manually, the compressor must cool down before it can start operation.

Circulation pumps

A circulation pump has an internal overload protection. It is reset automatically when the pump has cooled down.

However, a pump in a 10 to 16kW heat pump (air 8-12kW) has an internal overload relay that trips the motor protection alarm. The indication and reset are the same as for the compressor.

Auxiliary heat

The auxiliary heater is made up of an electric heating element on the supply line. It is equipped with a temperature guard which stops the heating element's operation if it risks being overheated. The temperature guard is placed on the electrical panel.

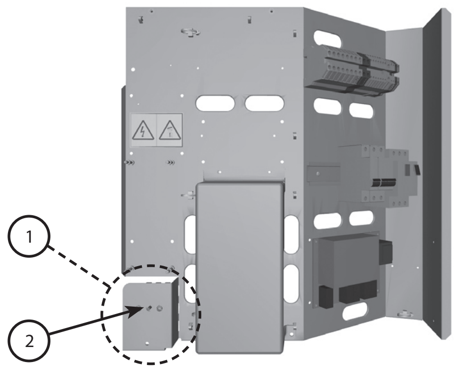


Figure 3: The temperature guard on the electrical panel.

Position	*Name*
1	Temperature guard
2	Reset button

If the temperature guard is tripped the alarm indicator on the front panel is flashing and an alarm text is displayed.

The temperature guard is reset by pushing the reset button (2).

⚠ The temperature guard must be reset by authorised personnel only.

Specifications

Please see the technical data tables at the end of this manual for detailed specifications.

2 Heat pump information

2.1 DHP-H

Dimensions and connections

The brine pipes can be connected on either the left or right-hand sides of the heat pump.

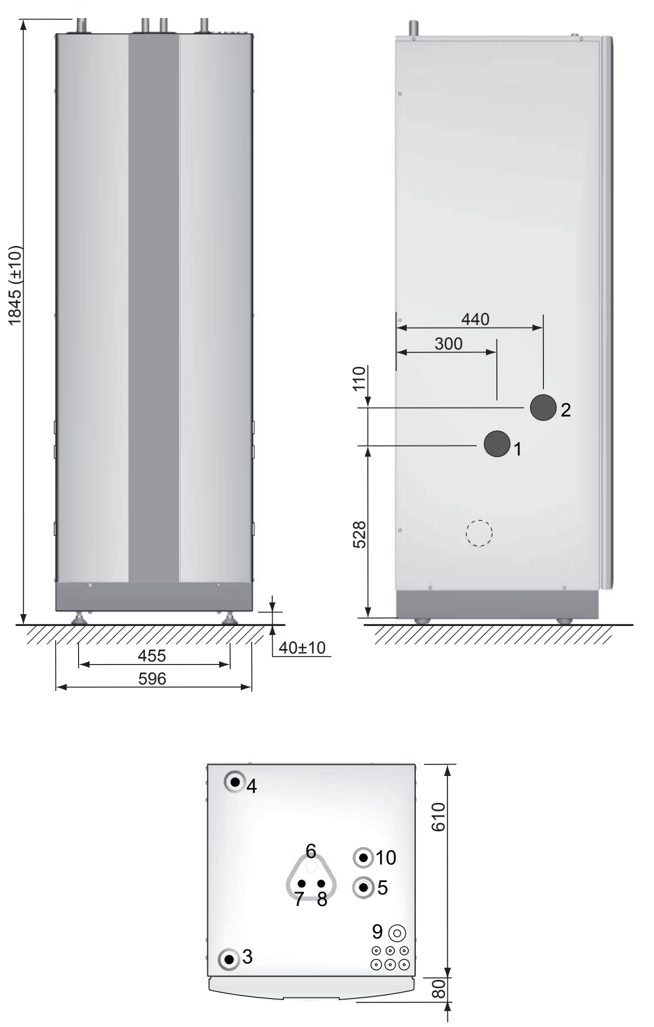


Figure 4: DHP-H and connections.

Position	**Name**
1	Brine in, 28 Cu
2	Brine out, 28 Cu
3	Heating system supply line, 22 Cu: 4-10 kW, 28 Cu: 12-16 kW
4	Heating system return line, 22 Cu: 4-10 kW, 28 Cu: 12-16 kW
5	Expansion line, 22 Cu
6	Lifting point
7	Hot water line, 22 Cu or stainless steel
8	Cold water line, 22 Cu or stainless steel
9	Lead-in for supply, sensor and communication cables
10	Safety valve for temperature and pressure (only applies to certain markets)

Components

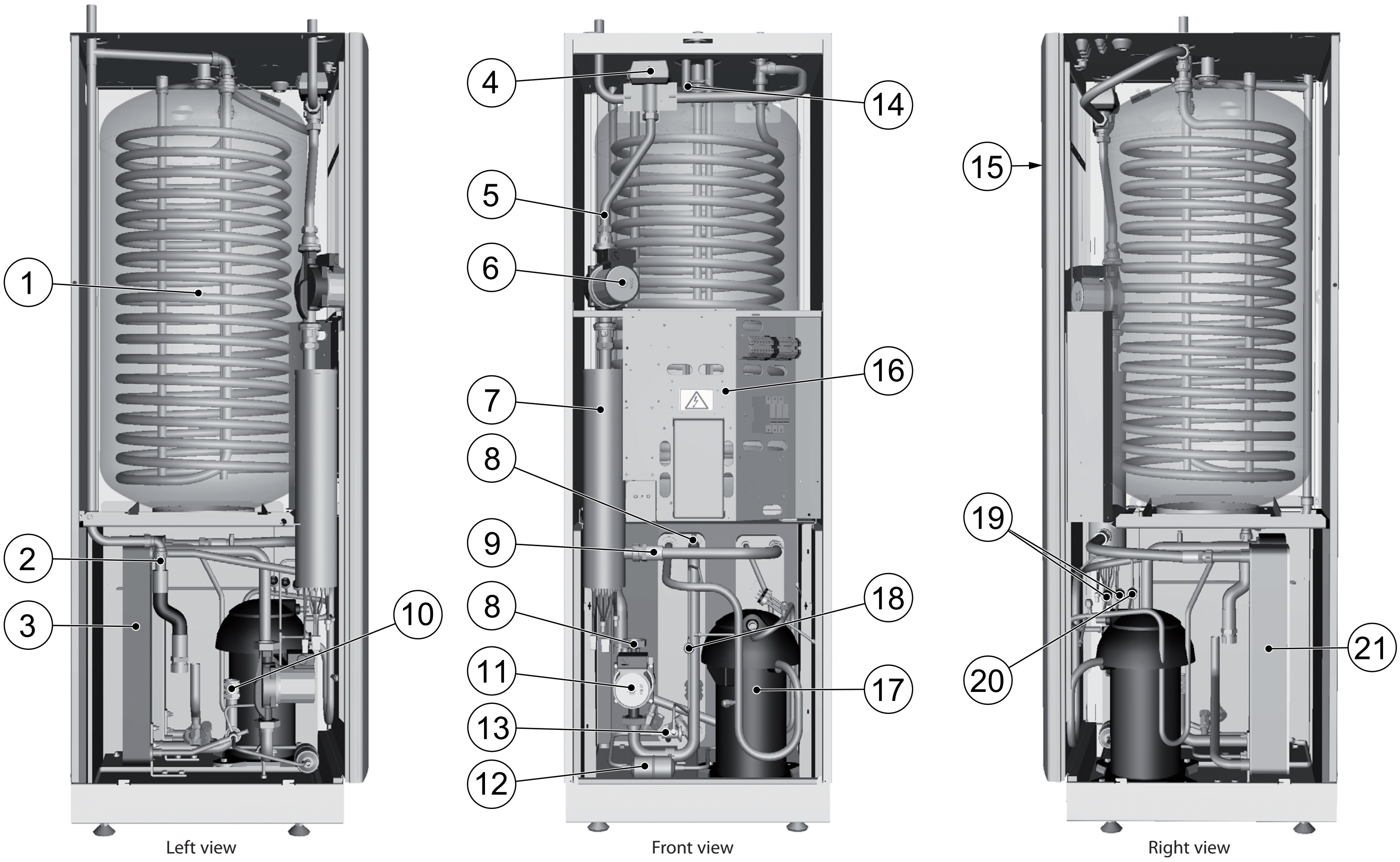


Figure 5: DHP-H, components.

Position	Name
1	Water heater, 180 litres
2	Return line sensor, heating system
3	Evaporator, insulated
4	Exchange valve
5	Supply line sensor
6	Heating system circulation pump
7	Auxiliary heating, immersion heater
8	Brine in
9	Heating system supply line
10	Brine out
11	Brine pump brine system
12	Drying filter
13	Expansion valve
14	Hot water temperature sensor (displays maximum temperature)
15	Control panel for control equipment
16	Electrical panel
17	Compressor
18	Low pressure pressostat
19	Operating pressostats
20	High pressure pressostat
21	Condenser with primary side drain

2.2 DHP-H Opti Pro

Dimensions and connections

The brine pipes can be connected on either the left or right-hand sides of the heat pump.

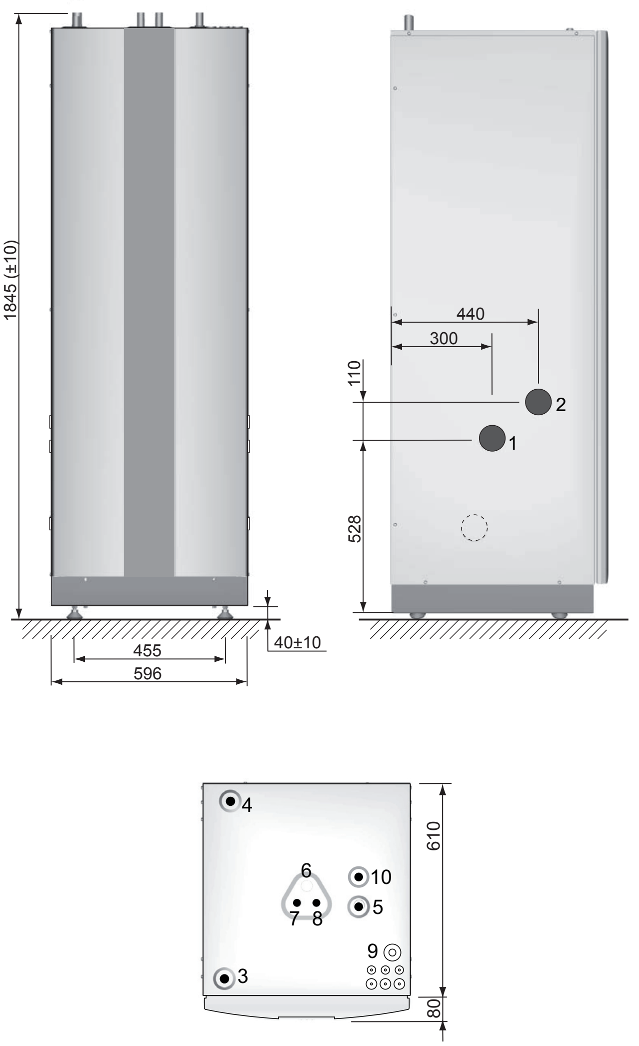


Figure 6: DHP-H, DHP-H Opti Pro and connections.

Position	Name
1	Brine in, 28 Cu
2	Brine out, 28 Cu
3	Heating system supply line, 22 Cu: 4-10 kW, 28 Cu: 12-16 kW
4	Heating system return line, 22 Cu: 4-10 kW, 28 Cu: 12-16 kW
5	Expansion line, 22 Cu
6	Lifting point
7	Hot water line, 22 Cu or stainless steel
8	Cold water line, 22 Cu or stainless steel
9	Lead-in for supply, sensor and communication cables
10	Safety valve for temperature and pressure (only applies to certain markets)

Components

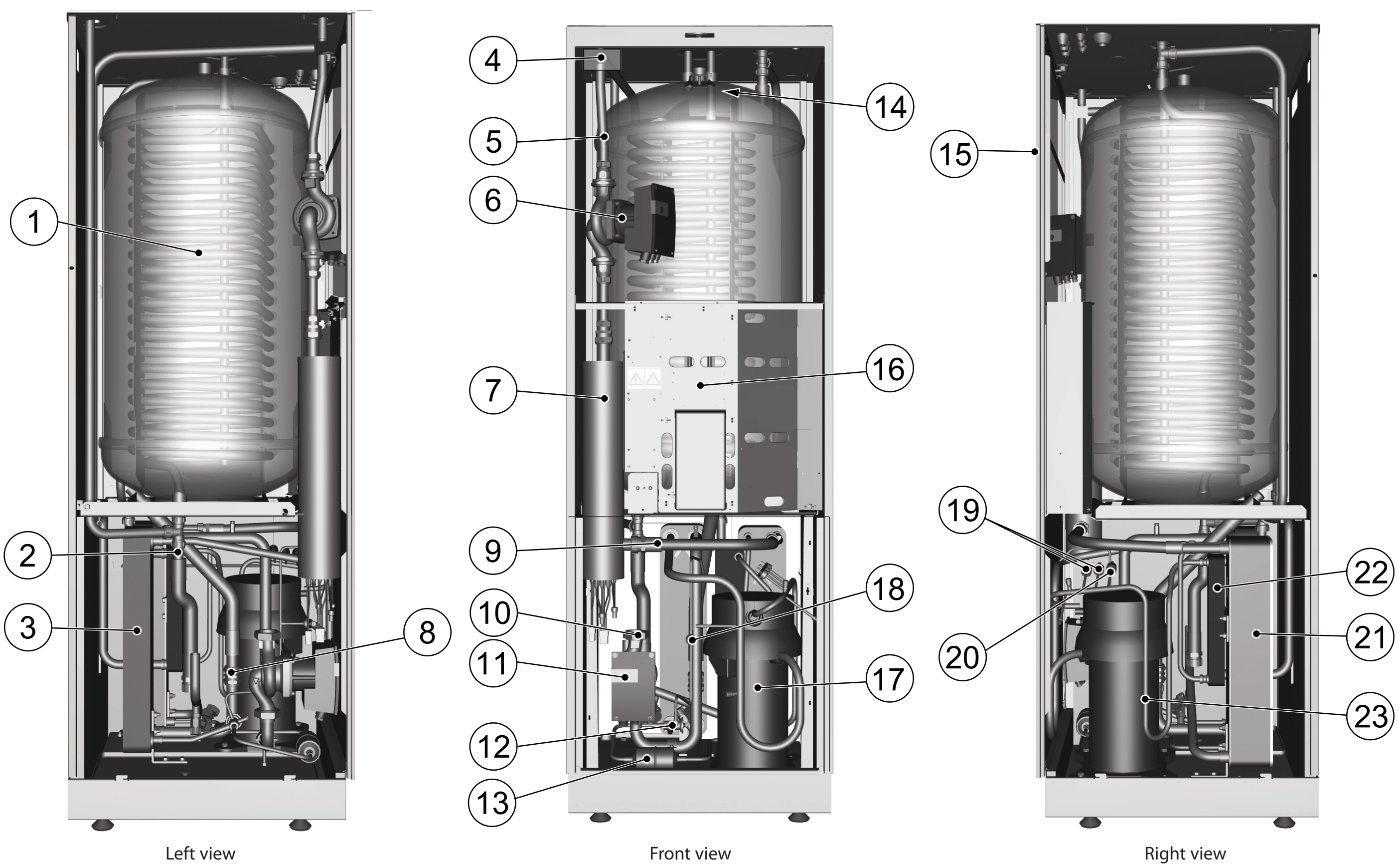


Figure 7: DHP-H Opti Pro, components.

Position	Name
1	Water heater, 180 litres
2	Return line sensor, heating system
3	Evaporator, insulated
4	HGW shunt valve
5	Supply line sensor
6	Heating system circulation pump
7	Auxiliary heating, immersion heater
8	Brine in
9	Heating system supply line
10	Brine out
11	Brine pump brine system
12	Drying filter
13	Expansion valve
14	Hot water temperature sensor (displays maximum temperature)
15	Control panel for control equipment
16	Electrical panel
17	Compressor
18	Low pressure pressostat
19	Operating pressostats
20	High pressure pressostat
21	Condenser with primary side drain
22	Hot gas heat exchanger
23	HGW sensor

2.3 DHP-C

Dimensions and connections

The brine pipes can be connected on either the left or right-hand sides of the heat pump.

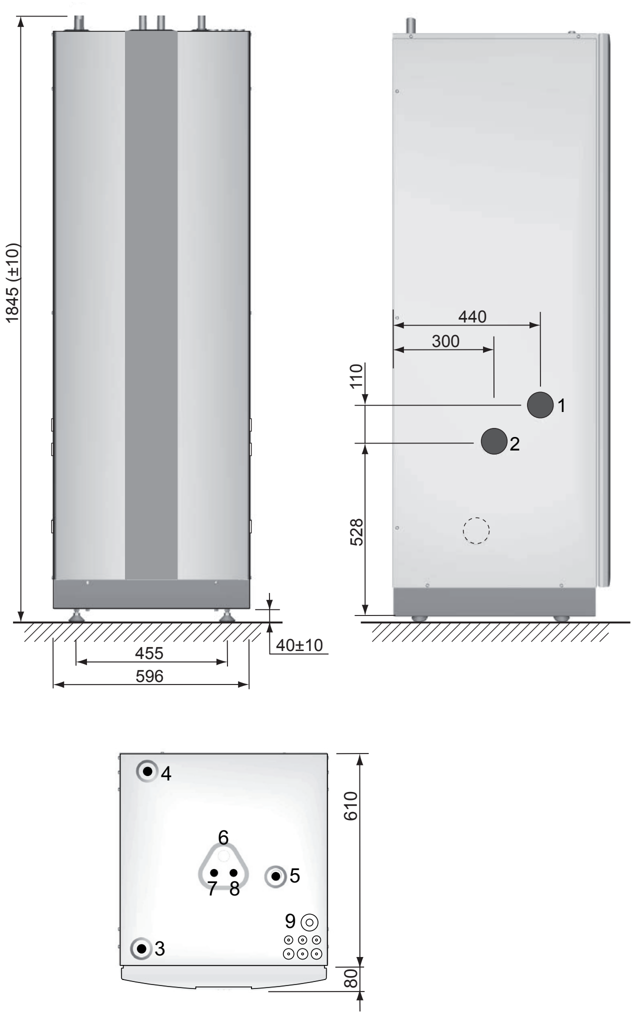


Figure 8: DHP-C, Dimensions and connections.

Position	**Name**
1	Brine in, 28 Cu
2	Brine out, 28 Cu
3	Supply line heating system, 22 Cu
4	Return line heating system, 22 Cu
5	Expansion line, 22 Cu
6	Lifting point
7	Hot water line, 22 Cu or stainless steel
8	Cold water line, 22 Cu or stainless steel
9	Lead-in for supply, sensor and communication cables

Components

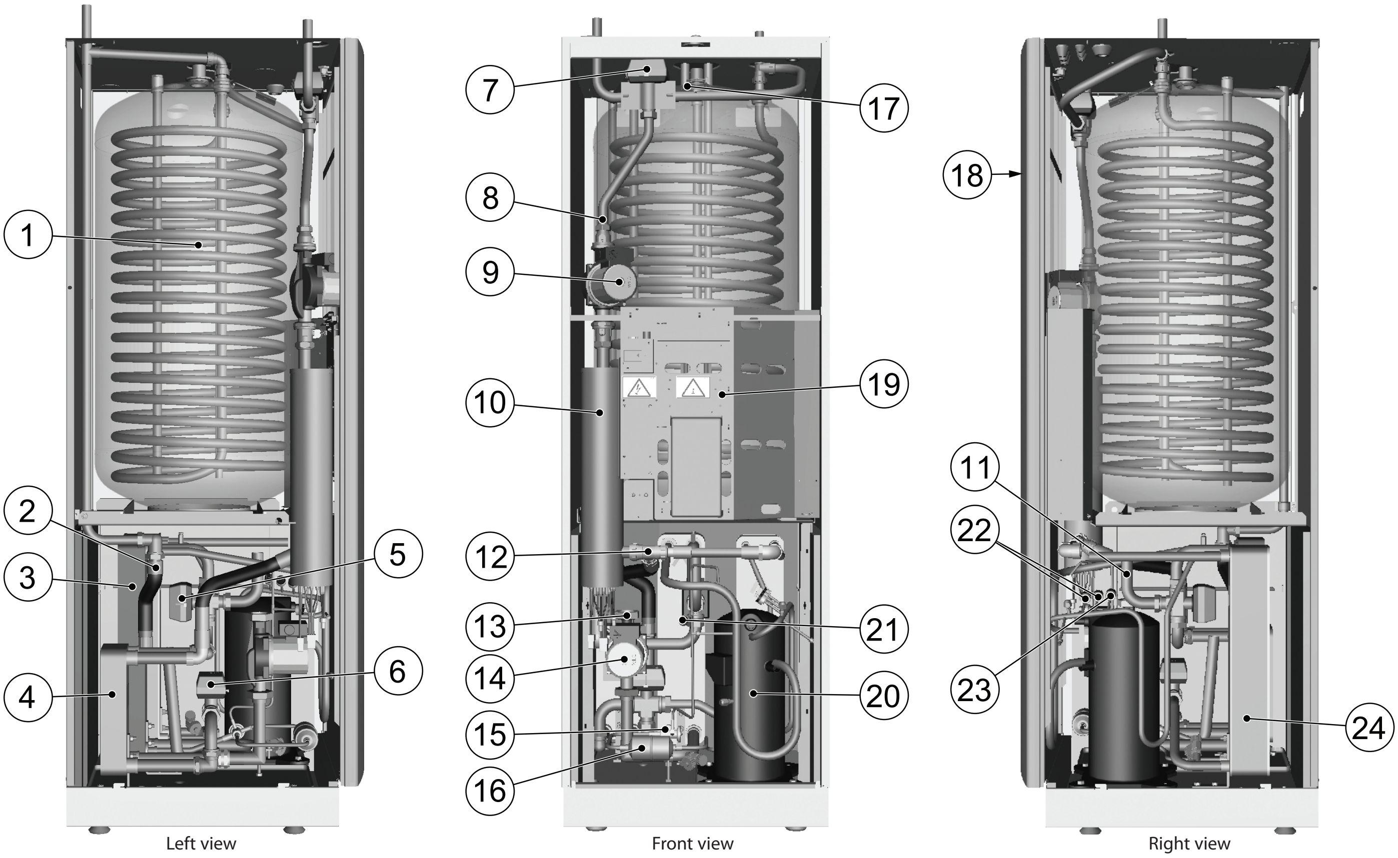


Figure 9: DHP-C, components.

Position	Name
1	Water heater, 180 litres
2	Return line sensor, heating system
3	Evaporator, insulated
4	HGW shunt valve
5	Exchange valve cooling
6	Shunt cooling
7	Exchange valve, heating/hot water
8	Supply line sensor
9	Heating system circulation pump
10	Auxiliary heating, immersion heater
11	Brine in
12	Heating system supply line
13	Brine out
14	Brine pump brine system
15	Expansion valve
16	Drying filter
17	Hot water temperature sensor (displays maximum temperature)
18	Control panel for control equipment
19	Electrical panel
20	Compressor
21	Low pressure pressostat
22	Operating pressostats
23	HGW sensor
24	Condenser with primary side drain

2.4 DHP-L, DHP-L Opti

Dimensions and connections

The brine pipes can be connected on either the left or right-hand sides of the heat pump.

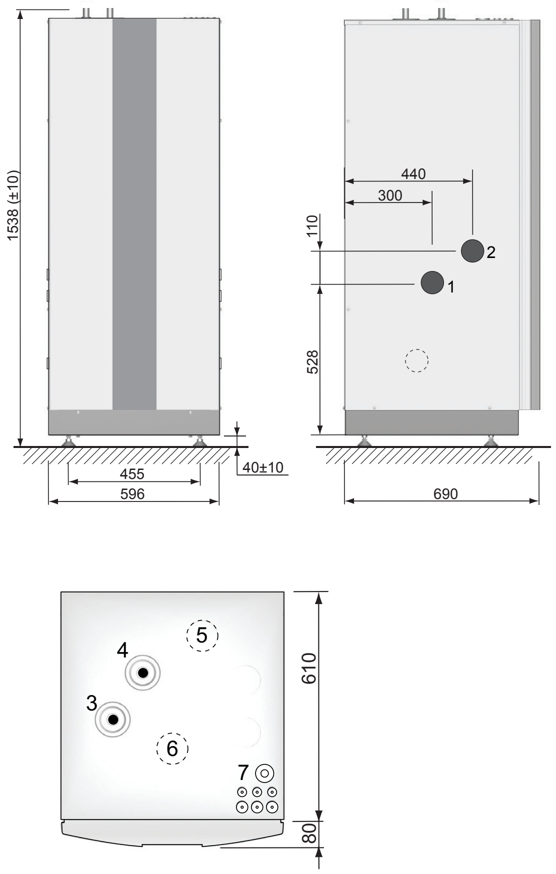


Figure 10: DHP-L, DHP-L Opti, Dimensions and connections.

Position	Name
1	Brine in, 28 Cu
2	Brine out, 28 Cu
3	Heating system supply line, 22 Cu: 4-10 kW, 28 Cu: 12-16 kW
4	Heating system return line, 22 Cu: 4-10 kW, 28 Cu: 12-16 kW
5	Alternative for brine out
6	Alternative for brine in
7	Lead-in for supply, sensor and communication cables

Components

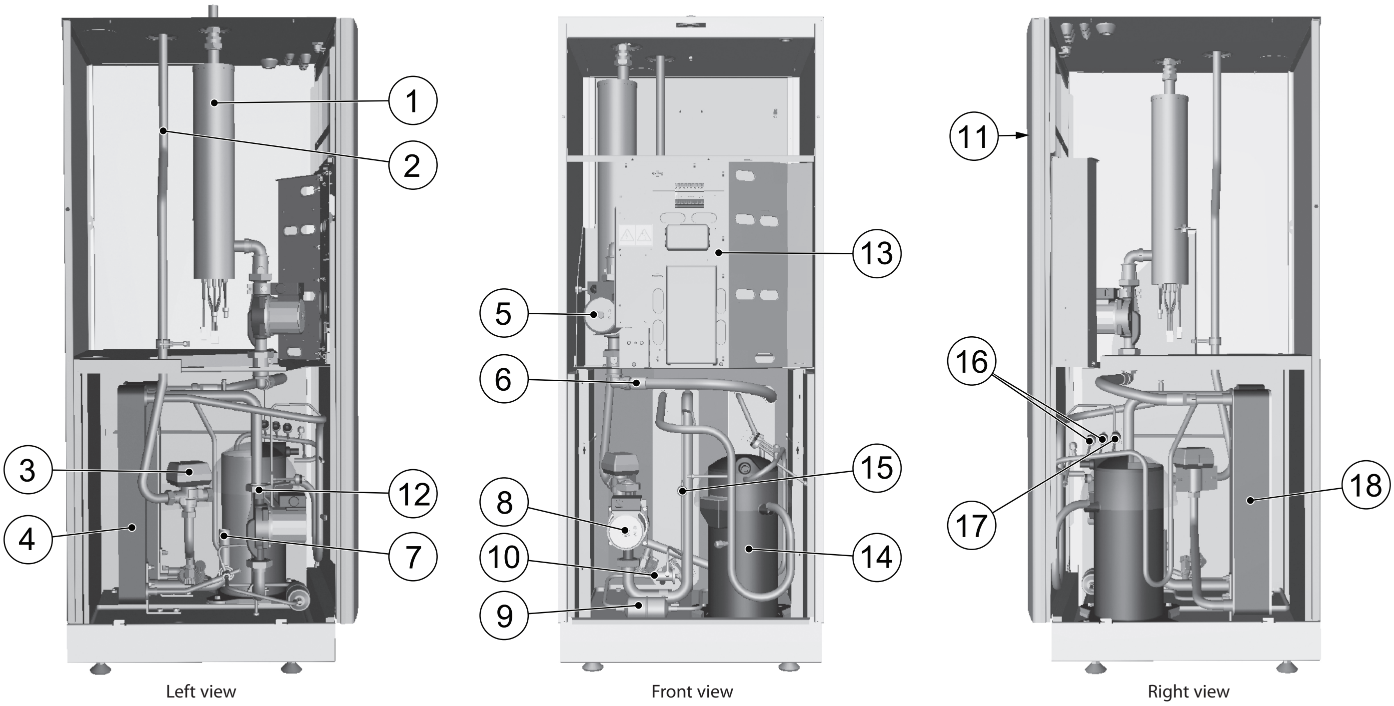


Figure 11: DHP-L, DHP-L Opti components.

Position	Name
1	Auxiliary heater, immersion heater on supply line
2	Return line, heating system
3	Exchange valve
4	Evaporator, insulated
5	Heating system circulation pump
6	Supply line sensor, heating system
7	Brine out
8	Brine pump brine system
9	Drying filter
10	Expansion valve
11	Control panel for control equipment
12	Brine in
13	Electrical panel
14	Compressor
15	Low pressure pressostat
16	Operating pressostats
17	High pressure pressostat
18	Condenser with primary side drain

2.5 DHP-A, DHP-A Opti

Dimensions and connections

The brine pipes can be connected on either the left or right-hand sides of the heat pump.

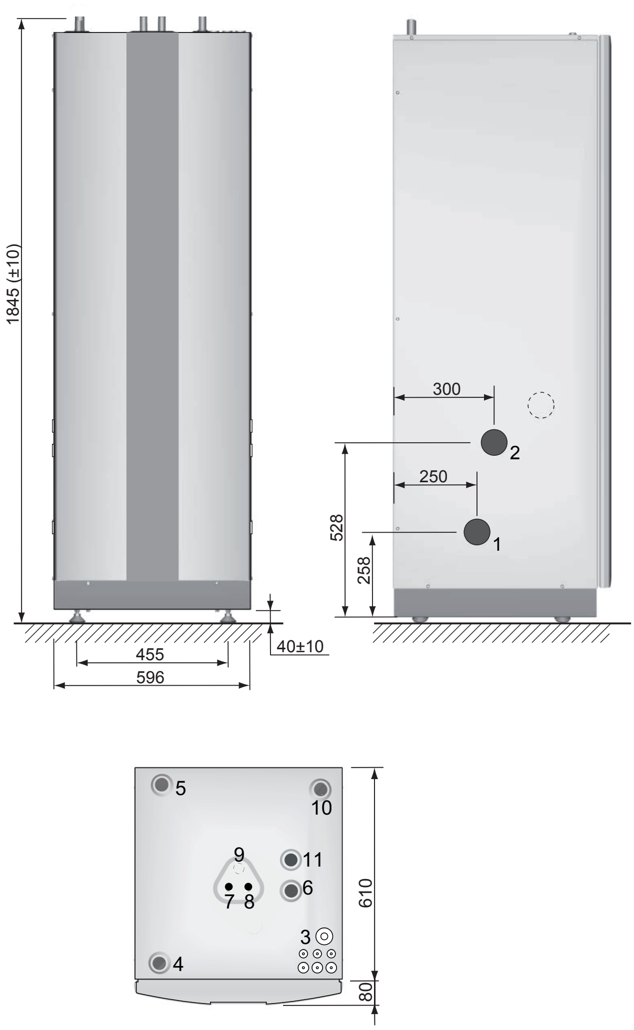


Figure 12: DHP-A, DHP-A Opti, Dimensions and connections.

Position	Name
1	Lead-in for incoming power supply, sensors and communication cable
2	Brine in, 28 Cu
3	Brine out, 28 Cu
4	Heating system supply line, 22 Cu: 6-10 kW, 28 Cu: 12 kW
5	Heating system return line, 22 Cu: 6-10 kW, 28 Cu: 12 kW
6	Expansion pipe, 22 Cu
7	Hot water pipe, 22 Cu or stainless steel
8	Cold water pipe, 22 Cu or stainless steel
9	Lifting point
10	Expansion outlet brine circuit, DN25 int.
11	Safety valve for temperature and pressure (only applies to certain markets)

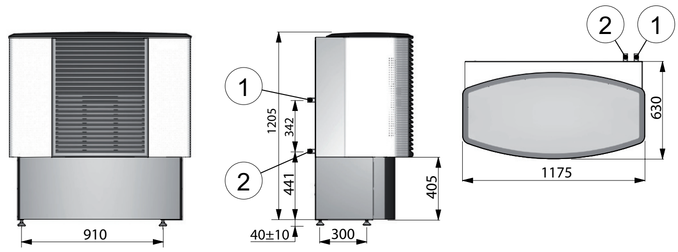


Figure 13: Outdoor unit, Dimensions and connections.

Position	Name
1	Brine in (from HP Brine out) 28 Cu
2	Brine out (to HP Brine in) 28 Cu

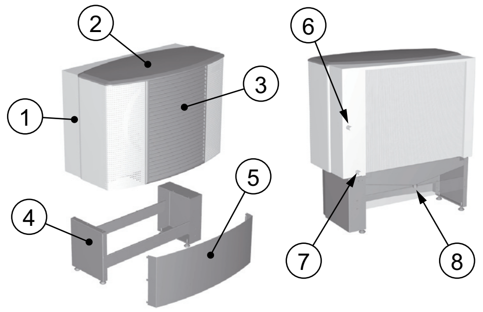


Figure 14: Outdoor unit components and connections

Position	Name
1	Outdoor unit
2	Cover
3	Front cover
4	Stand
5	Cover
6	Connection, brine in
7	Connection, brine out
8	Connection, drain drip tray

Check that the delivery of the outdoor unit contains the following:

- Outdoor unit
- Disassembled stand
- Necessary screws, nuts and washers.
- Defroster sensor

Components

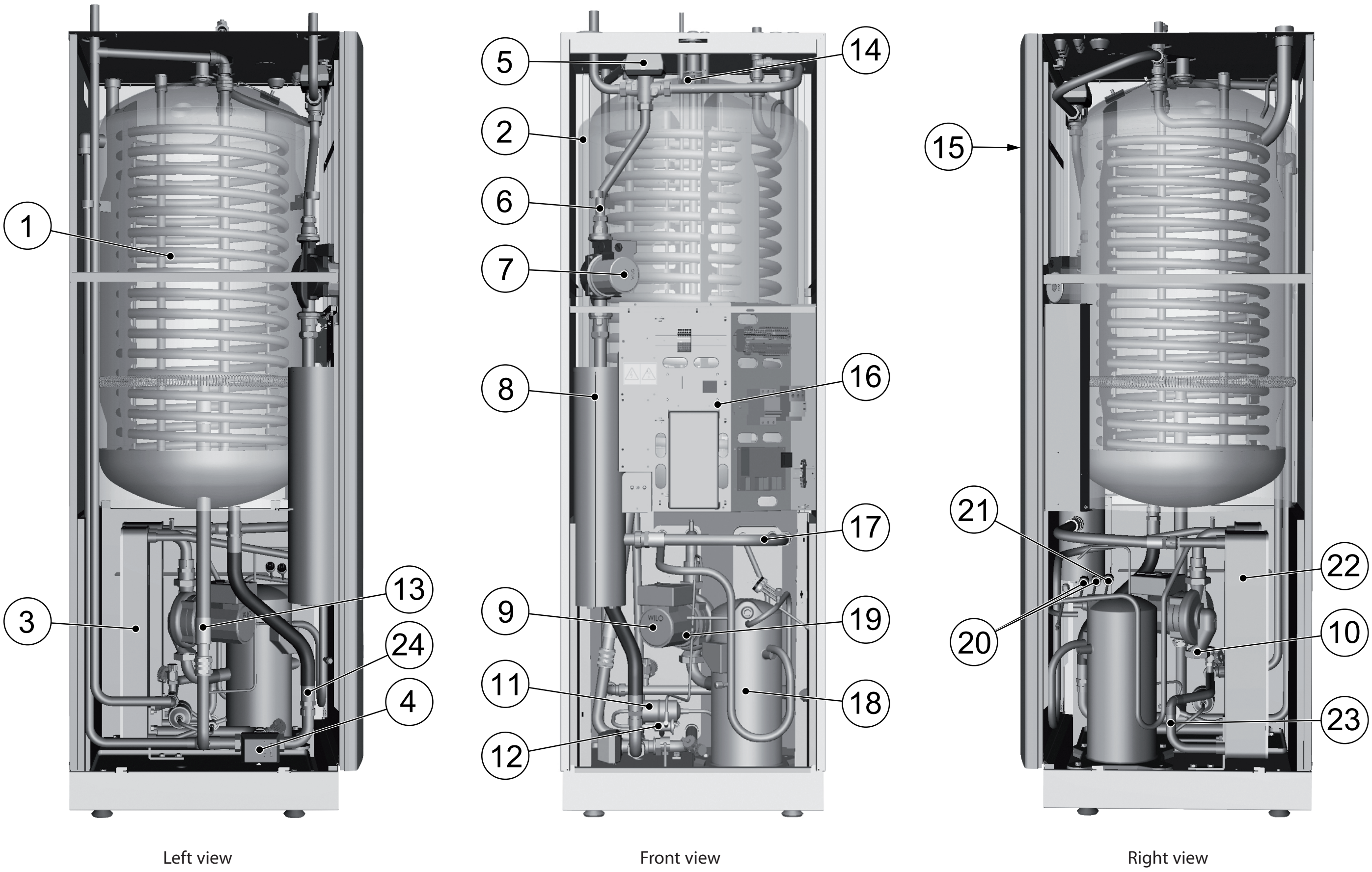


Figure 15: DHP-A, DHP-A Opti, components.

Position	**Name**
1	Water heater, 180 litres
2	Defrosting tank
3	Evaporator, insulated
4	Shunt valve, defrosting
5	Exchange valve, heating system
6	Supply line sensor
7	Heating system circulation pump
8	Auxiliary heating, immersion heater
9	Brine pump brine system
10	Brine in
11	Drying filter
12	Expansion valve
13	Brine out to outdoor unit
14	Hot water temperature sensor (displays maximum temperature)
15	Control panel for control equipment
16	Electrical panel
17	Heating system supply line
18	Compressor
19	Low pressure pressostat
20	Operating pressostats
21	High pressure pressostat
22	Condenser with primary side drain
23	Return line sensor, heating system
24	Brine in to defrosting tank during defrosting

2.6 DHP-AL, DHP-AL Opti

Dimensions and connections

The brine lines can be connected on either the left or right-hand sides of the heat pump.

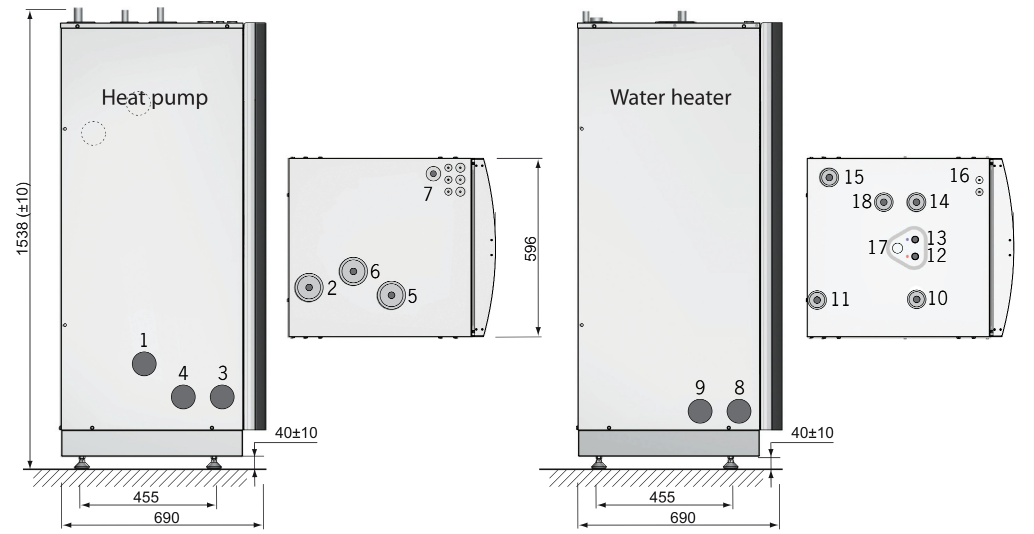


Figure 16: DHP-AL, DHP-AL Opti dimensions and connections.

Position	Name
1	Brine in, 28 Cu
2	Brine out, during normal operation, 28 Cu
3	Brine out, during defrosting to hwh pos 8, 28 Cu
4	Return pipe from water heater pos 9, 28 Cu
5	Heating system supply line, 22 Cu: 6-10 kW, 28 Cu: 12 kW
6	Heating system return line, 22 Cu: 6-10 kW, 28 Cu: 12 kW
7	Lead-in power and sensor lead
Water heater	
8	Connection for brine out when defrosting from pos 3
9	Water heater, return pipe to pos 4
10	Bleed valve, at stainless steel water heater
11	Brine out during defrosting, 28 Cu
12	Domestic hot water, 22 Cu
13	Cold water
14	Supply to water heater coil
15	Brine, expansion outlet when outdoor unit is positioned at high level
16	Lead-in sensor lead
17	Lifting point
18	Safety valve for temperature and pressure (only applies to certain markets)

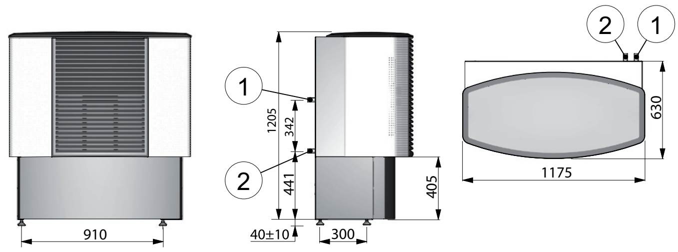


Figure 17: Outdoor unit, dimensions and connections.

Position	Name
1	Brine in, 28 Cu
2	Brine out, 28 Cu

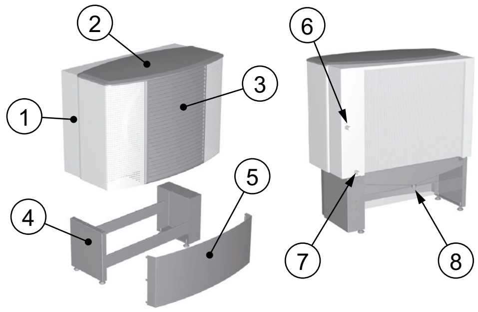


Figure 18: Outdoor unit components and connections.

Position	Name
1	Outdoor unit
2	Cover
3	Front cover
4	Stand
5	Cover
6	Connection, brine in
7	Connection, brine out
8	Connection, drain drip tray

Check that the delivery of the outdoor unit contains the following:

- Outdoor unit
- Disassembled stand
- Necessary screws, nuts and washers.
- Defrost sensor

Components

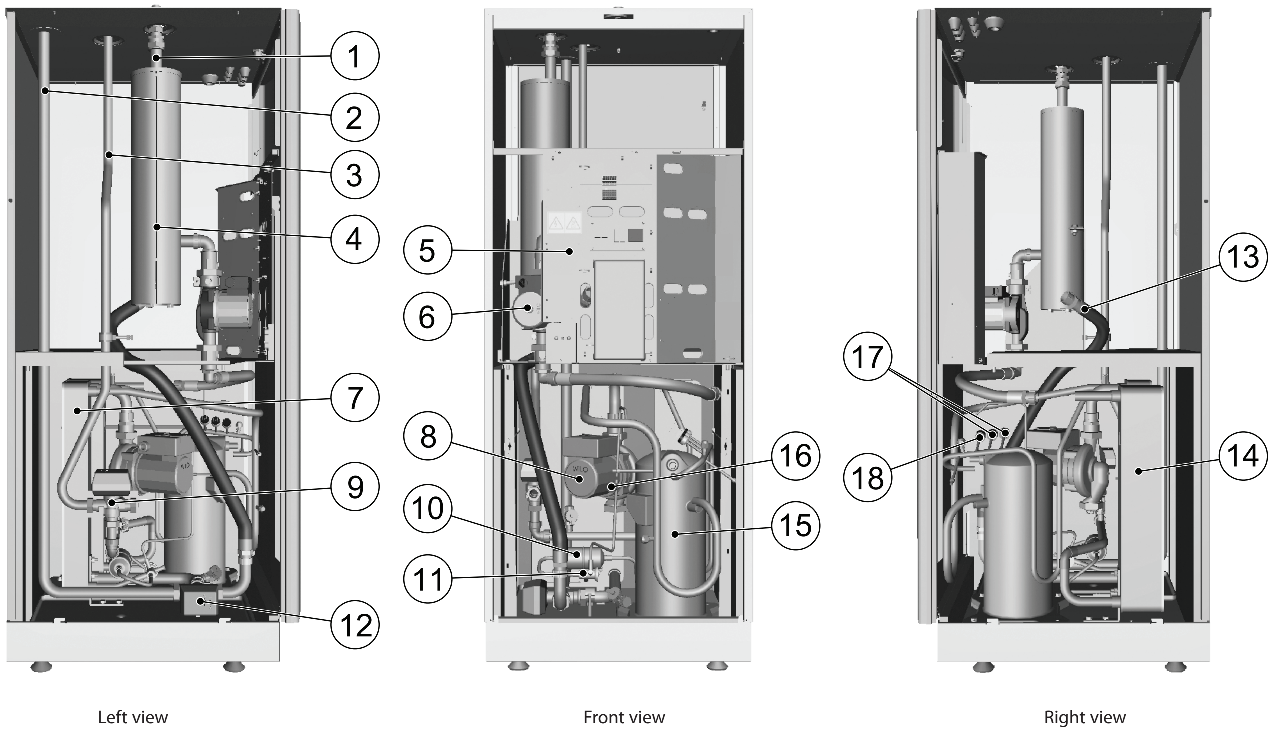


Figure 19: DHP-AL, DHP-AL Opti components.

Position	Name
1	Heating system supply line
2	Brine out to outdoor unit
3	Return line, heating system
4	Auxiliary heating, immersion heater
5	Electrical panel
6	Heating system circulation pump
7	Evaporator
8	Circulation pump coolant system
9	Exchange valve, heating system
10	Drying filter
11	Expansion valve
12	Shunt valve defrosting
13	Brine in to defrosting tank during defrosting
14	Condenser
15	Compressor
16	Low pressure pressostat
17	Operating pressostats
18	High pressure pressostat

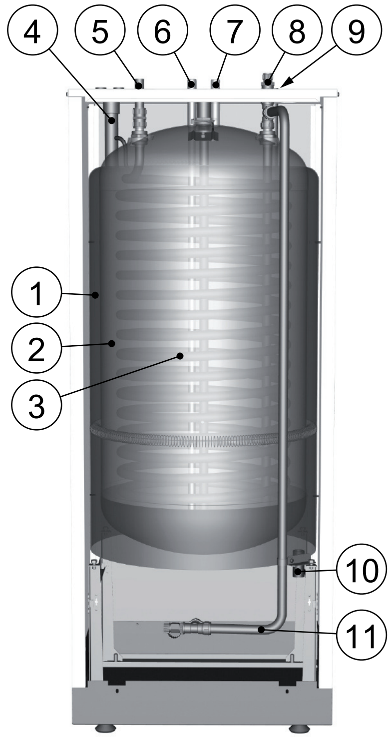


Figure 20: Water heater components and connections.

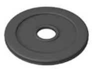
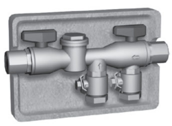
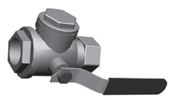
Position	Name
1	Defrosting tank
2	Water heater
3	TWS coil
4	Connection, brine out during defrosting
5	Bleed valve, at stainless steel water heater
6	Domestic hot water
7	Cold water
8	Connection, to TWS coil
9	Connection, expansion line when outdoor unit is positioned at high level
10	Connection, brine from heat pump
11	Connection, return line to heat pump

2.7 Package contents

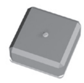
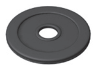
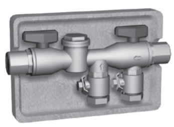
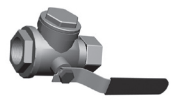
Delivery check

1. Check that there is no transport damage. The heat pump is packaged in cardboard.
2. Remove the plastic wrapping and check that the delivery contains the following components.

Sizes 4kW - 10kW:

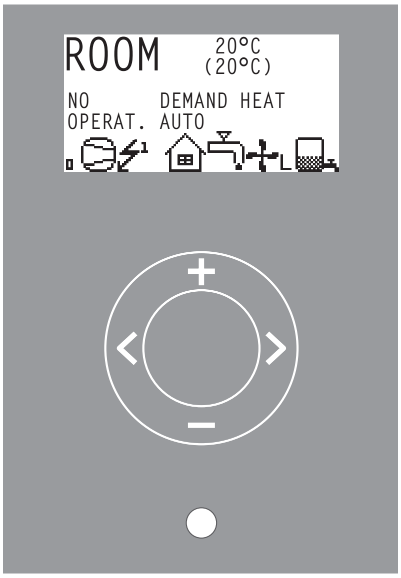
Part no.	Quantity	Name
086U2369 	1	Safety valve 9 bar 1/2"
086U2701 	1	Outdoor sensor Kimsafe 200 035
086U0896 	1	Safety valve 1,5 bar 1/2"
086U2824 	1	Expansion and bleed tank without valve
086U0026 	5	Rubber collar hole 22-32mm
086U6033 	2	Flex. hose DN20 L=550
086U6006 	1	Filling device brine DN25
086U6005 	1	Dirt filter with shut-off DN25

Sizes 12kW - 16kW:

Part no.	Quantity	Name
086U2369 	1	Safety valve 9 bar 1/2"
086U2701 	1	Outdoor sensor Kimsafe 200 035
086U0896 	1	Safety valve 1,5 bar 1/2"
086U2824 	1	Expansion and bleed tank without valve
086U0026 	5	Rubber collar hole 22-32mm
086U6034 	2	Flex. hose DN25 L=550
086U6007 	1	Filling device brine DN32
086U6005 	1	Dirt filter with shut-off DN25

2.8 Heat pump control panel

The heat pump control panel consists of a display, four control buttons and an indicator.



The symbols in the display are only examples. Certain symbols cannot be displayed at the same time.

Figure 21: Display, control buttons and indicator for the heat pump.

The control computer is controlled using a user-friendly menu system, displayed in the display.

Use the four control buttons to navigate the menus and increase or reduce the set values:

- An up button with a plus sign +
- A down button with a minus sign –
- A right button with a right arrow >
- A left button with a left arrow <

The main menu, INFORMATION, is opened by pressing the left or right buttons. From INFORMATION one of the four sub-menus can be opened: OPERAT.; HEATCURVE; TEMPERATURE and OPERAT. TIME.

For installation or service, the hidden menu, SERVICE, is used. This is opened by holding the left button depressed for five seconds. From the SERVICE menu one of the following sub-menus can be opened: WARMWATER; HEATPUMP; ADD.HEAT; MANUAL TEST and INSTALLATION.

For further information about the menus see the service instructions.

The indicator at the bottom of the control panel has two modes:

- Lit steadily, the installation has power and is ready to produce heat or hot water
- Flashing, means an active alarm

2.9 Transporting the heat pump

The heat pump must always be transported and stored upright. Secure the heat pump so that it cannot tip over during transportation.

When transporting indoors to the installation location it may be necessary to place the heat pump on its back. The time that the heat pump is transported on its back should be as short as possible. After the heat pump has been lifted up again it must stand upright for at least an hour before commissioning.

2.10 Space requirement

To facilitate the installation and subsequent testing and maintenance it is recommended that there is sufficient free space around the heat pump in accordance with the following dimensions:

- 300 mm on each side
- 300 mm above
- 600 mm in front
- 10 mm behind

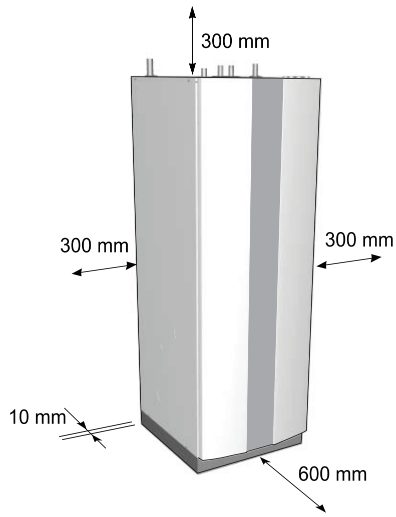


Figure 22: Necessary service space.

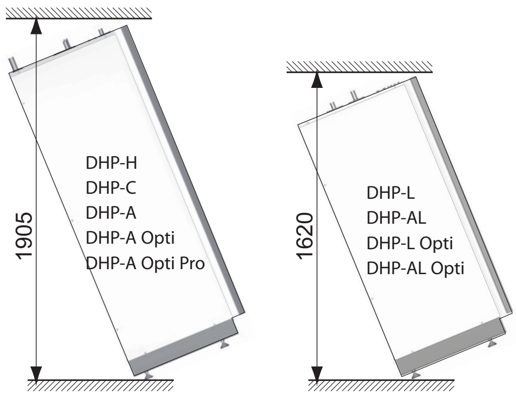


Figure 23: Minimum headroom for heat pump installation.

2.11 Recommended location

⚠ To avoid condensation problems for the brine pipes, as short a brine pipe as possible is recommended.

The heat pump should be located on a stable floor, preferably made of concrete. When locating the heat pump on a wooden floor this should be reinforced to take the weight. One solution is to place a thick metal plate, at least 6mm, under the heat pump. The metal plate should cover several joists spreading the weight of the heat pump over a larger area. If the heat pump is being installed in a newly-built house, this has normally been taken into account during construction, and the joists where the heat pump will be located have been reinforced. Always check that this has been carried out when installing into a newly-built house. Avoid positioning the heat pump in a corner as the surrounding walls may amplify its noise. It is also important to adjust the heat pump using the adjustable feet so that it is horizontal to the base.

2.12 Space requirement, outdoor unit, DHP-A, -AL

- To ensure the function of the outdoor unit, there must be at least 300 mm of space behind and 1500 mm at the front.
- For maintenance work there must be approximately 300 mm of space at the sides of the outdoor unit.

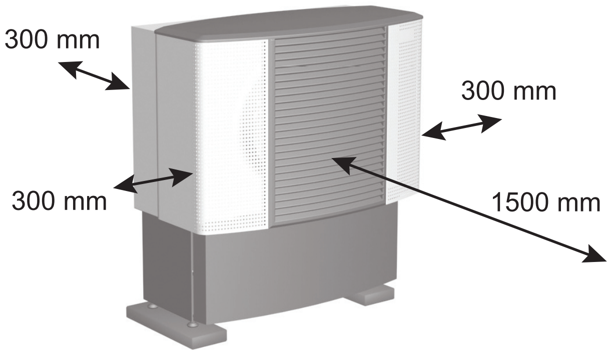


Figure 24: Necessary service space for outdoor unit.

2.13 Recommended location of outdoor unit, DHP-A, -AL

When positioning the outdoor unit, note the following:

⚠ The outdoor unit does not have to be positioned in any specific direction.

⚠ Noise is produced from the outdoor unit when the fan is in operation, remember this when positioning to reduce disturbance in your own home as well as to any neighbours.

⚠ When the outdoor unit is defrosting, water will drip straight down under the unit. The area around the outdoor unit must therefore be properly drained in order to catch the water (approximately 2 litres per defrost).

⚠ Remember that the outdoor unit must have a certain amount of room in order to function and for servicing, see “Heat pump information” chapter.

⚠ Remember that the water that drips from the outdoor unit during defrost must be able to drain into the ground. The outdoor unit must therefore not be positioned on asphalt or slabs where water cannot drain easily.

⚠ The outdoor unit’s adjustable stand must be positioned on a secure base such as wooden sleepers, paving slabs or cast footings.

3 Drilling holes for brine pipes

⚠ NOTE! Ensure that the holes for the insert pipes are positioned so that there is room for the other installations.

⚠ NOTE! The brine pipes shall have separate lead-ins.

⚠ If the wall lead-ins are below the highest ground water level watertight lead-ins must be used.

The brine pipes must be insulated from the heat pump, through the walls and outside the house all the way to the collector so as to avoid condensation and prevent heat loss.

If the brine pipes are to be routed above ground, drill holes in the walls for them.

If the brine pipes are to be routed below ground see the instructions below.

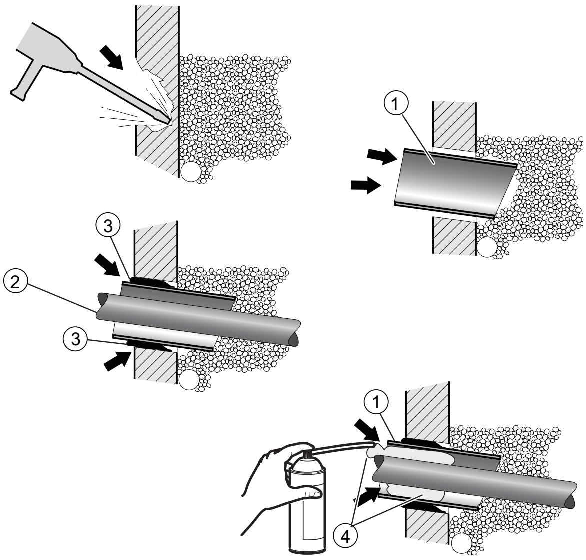


Figure 25: Drilling holes for brine pipes.

Position	Name
1	Insert pipe
2	Brine pipe
3	Mortar
4	Sealant

1. Drill holes in the wall for the insert pipes (1) for the brine pipes. Follow the dimension and connection diagrams in the section “Heat pump information”. If there is any risk of groundwater infiltration at brine pipe lead-ins, watertight grommets must be used.
2. Position the insert pipes (1) in the holes sloping downwards. The inclination must be at least 1cm every 30cm. Cut them at an angle (as illustrated) so that rain water cannot get into the pipes.
3. Insert the brine pipes (2) into the insert pipes in the installation room.
4. Fill in the holes in the wall with mortar (3).
5. Ensure that the brine pipes (2) are centred in the insert pipes (1) so that the insulation is distributed equally on all sides.
6. Seal the insert pipes (1) with a suitable sealant (foam) (4).

4 Separating the heat pump

Does not apply to DHP-A, -AL.

If there is a shortage of space when transporting the heat pump to the installation location it may be necessary to separate the heat pump unit and the water heater.

The following instruction describes how the heat pump is separated to transport the separate parts more easily.

NOTE! Do not lift heavy equipment alone, always use two people for heavy lifting.

1. Remove the packaging.
2. Press against the front cover; and turn the catch 90° degrees anti-clockwise to release the front cover.
3. Tilt the front cover outwards.
4. Lift the front cover upwards to remove it from the heat pump.

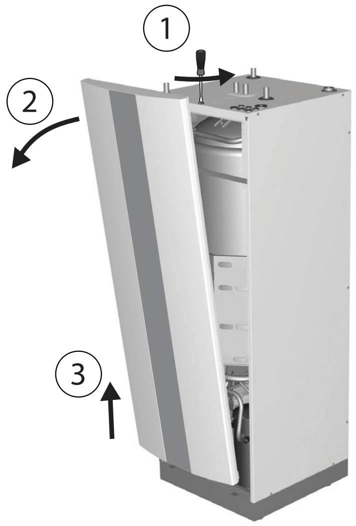


Figure 26: The front cover.

5. Carefully pull the switch free from the control panel.
6. Unscrew the front stay bar and top panel.
7. Pull the side panels forward and then upwards and outwards to remove them.

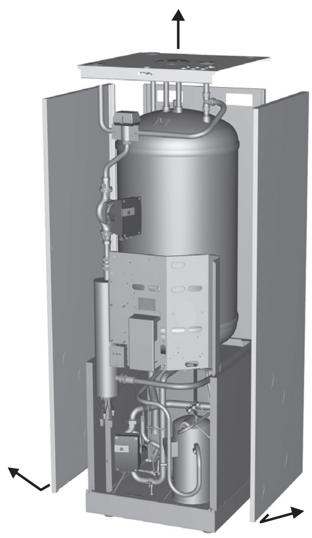


Figure 27: Covers.

8. Slacken off the screws that hold the rear panel and remove it.
9. Disconnect the electrical connectors at the exchange valve, circulation pump and electrical auxiliary heater.
10. Disconnect the cables for the following sensors at the electrical panel:
    - Supply line (301, 302)
    - Hot water (311, 312)
    -Top sensor (325, 326)
11. Unscrew the electrical panel's screws.
12. Turn the electrical panel through 180° and place it in front of the heat pump unit.

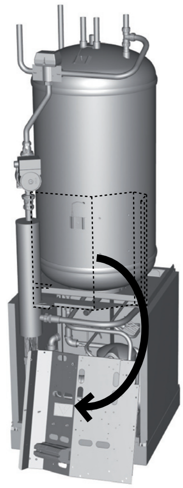


Figure 28: Electrical panel.

13. Disconnect the T-pipe connector from the return line under the heater, see figure below.
14. Disconnect the flexible hose at the electrical auxiliary heater, see figure below.

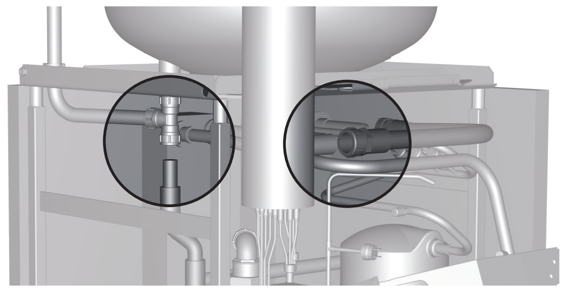


Figure 29: Connections.

15. Unscrew the four screws in the corners that hold the water heater's bottom plate.

NOTE! Always use two people for heavy lifting.

16. Lift off the unit with the water heater, pipe and electrical auxiliary heater.

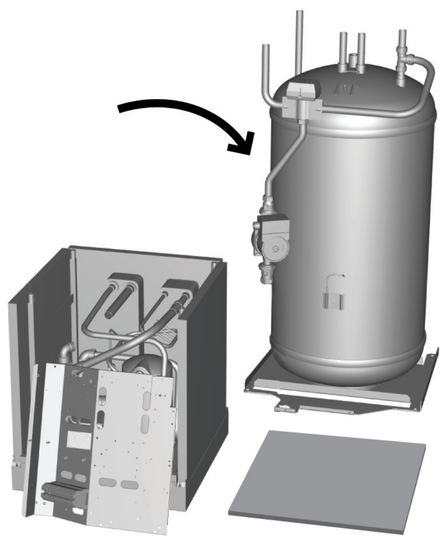


Figure 30: Separating.

17. Put the unit down carefully.

5 Unpacking and installation

5.1 Setting up

- The heat pump has feet that can be adjusted 20 mm to compensate for irregularities in the surface on which it is sitting. If the surface is so irregular that the feet cannot compensate for it, the installation engineer must remedy this.
- It is recommended that a condensation drain be installed from the drain pipe of the drip tray while the heat pump is on its side. The drain pipe opens through a hole in the base plate and has a Ø 10 mm hose connection.

1. Move the heat pump to the installation site. If there is little space the heat pump can be separated according to the section “Separating the heat pump”.
2. Remove the packaging.

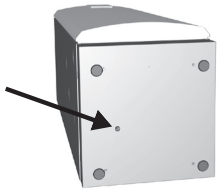


Figure 31: Condensation drain connection

3. Install a condensation drain on the connection in the base plate if required.
4. Set up the heat pump in the installation site.

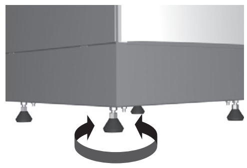


Figure 32: Adjusting the feet.

5. Adjust the feet so that it is horizontal.

5.2 Removing the front cover

NOTE! Do not damage the electrical wiring for the control computer when the front cover is removed!

To install the heat pump the front cover must be removed.

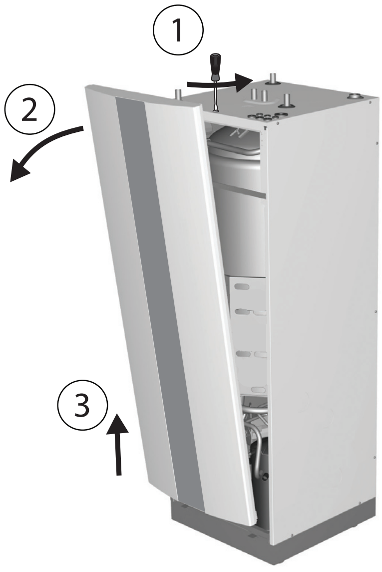


Figure 33: Removing the front cover.

1. Hold the front panel with one hand and turn the catch 90° anti-clockwise to detach the front panel.
2. Tilt the front cover outwards.
3. Lift the front cover upwards to remove it from the heat pump.

5.3 Unpacking and installing the outdoor unit

Applies to DHP-A, -AL.

The outdoor unit is packed and delivered in a crate.

1. Start by unpacking the unit from the crate.
2. Check that the delivery is complete, it must contain the outdoor unit, front cover, cover as well as a disassembled stand including necessary screws, nuts and washers.

Assembling the stand

1. Screw the two horizontal struts together (1) using the two ends (2) as illustrated below. Use 8 x M6x10 screws. The curved edges of the horizontal struts must be facing upwards and inwards.

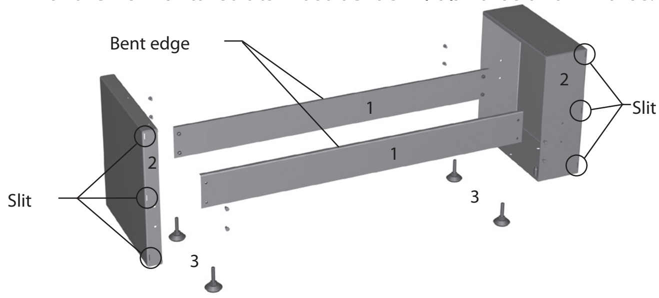


Figure 34: Assembling the stand.

2. Screw the adjustable feet (3) into the holes under the ends.

Preparing the outdoor unit

While the outdoor section remains on the pallet it should be prepared for placing on the stand. Carry out the following:

3. There are three M6x20 screws on the lower edge of the outdoor unit. Unscrew them so that 2-3 mm of the thread remains. Use a torx TX25 screwdriver, or equivalent.
4. Raise the outdoor unit. NOTE! Do not lift the side plates.
5. Remove the side plates. They are held in place by clamps and so are removed by pulling outwards.
6. Remove all four screwed lifting eyes. Use a 13 mm wrench, or equivalent.

Assembling the outdoor unit on the stand

7. Lift the outdoor unit into the place on the stand.

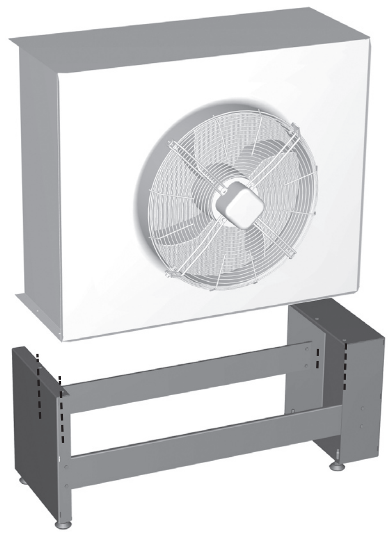


Figure 35: Lift the outdoor unit onto the stand.

8. Screw the outdoor unit onto the stand. Use 4 x M6x20 screws. It may be necessary to push and pull the stand slightly in order to get the screw holes to align.

⚠ NOTE! When filling the brine system the outdoor unit must be bled using the bleed screws on the connecting pipes inside the side covers. We recommend that you return to this instruction after the brine system has been filled.

9. Reinstall the side panels.

Assembling the front cover

10. Hook the lower edge of the front cover onto at least one of the three screws in the bottom edge of the stand.
11. Secure the upper edge of the front panel temporarily in the centre hole. Use 1 x M6x15 torx TX25.
12. Align all the three screws in the lower edge.
13. Screw the three screws in the lower edge fully. Use a torx TX25 screwdriver, or equivalent.
14. Secure the upper edge of the front cover.

Use only the three screws screwed into the outdoor unit, see figure below. Use only 3 x M6x15 torx TX25.

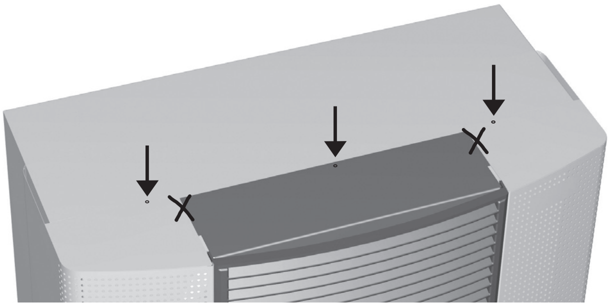


Figure 36: Secure the cover.

Assembling the cover and cover plate

15. Hook the cover at the front edge on the front cover.

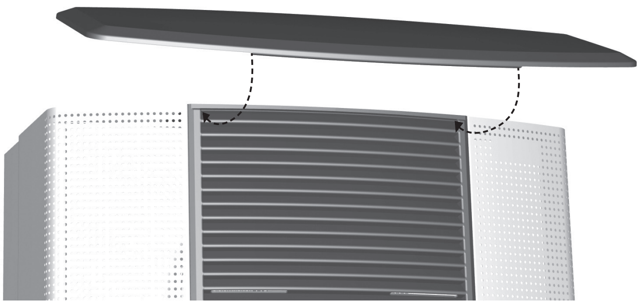


Figure 37: Hook the front cover into place.

16. Secure the cover using a screw on each side. Use 2 x cross head screws.

If the cover does not align with the side cover plates it may be necessary to drill new Ø 3 mm holes:

- Mark for the new holes
- Lift off the cover
- Drill the holes
- Install and screw the cover into place

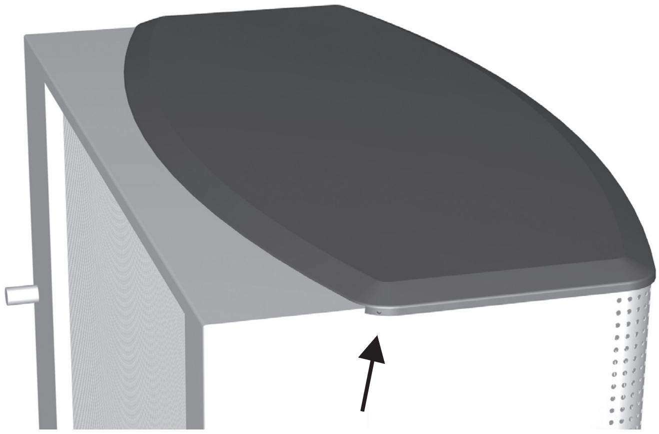


Figure 38: Screw the front cover into place.

17. Hook the cover onto the stand.

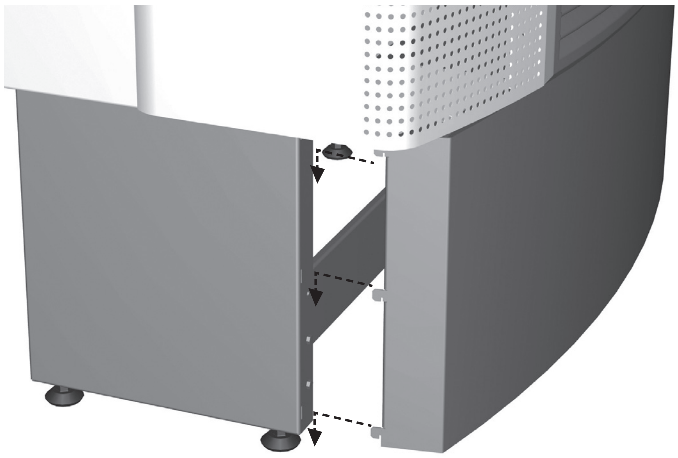


Figure 39: Hook the cover into place.

Assembling the defrost sensor

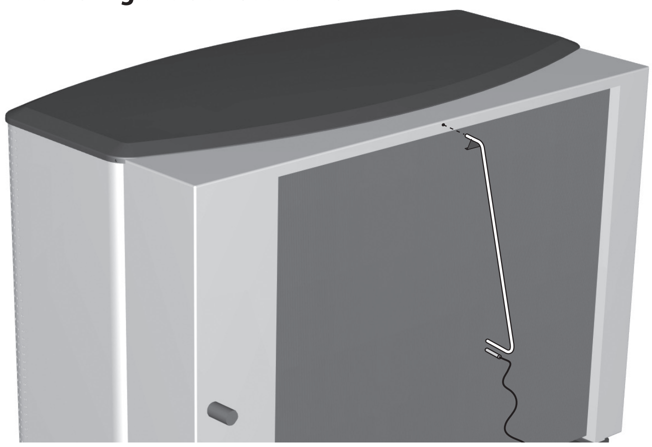


Figure 40: Hook the defroster sensor into place.

18. Slide the mounting for the defroster sensor into the hole on the reverse of the outdoor unit until it hooks into place on the edge.
19. Secure the defroster sensor at the bottom of the mounting using a cable tie.

The outdoor unit is now mounted and can be adjusted on the site where it should be set up.

6 Piping installation

NOTE! To prevent leaks, ensure that there are no stresses in the connecting pipes!

NOTE! It is important that the heating system is completely bled after installation.

NOTE! The connection diagrams show general piping arrangements. It is imperative that piping installation is carried out in accordance with applicable local rules and regulations. The hot water tank must be equipped with an approved safety valve (supplied).

NOTE! Bleed valves must be installed where necessary.

- Ensure that the piping installation follows the dimension and connection diagrams in section “Heat pump information”.
- For UK specific advice on piping arrangements please refer to the ‘UK-specific appendix to Installation and Service Instructions'. An approved safety valve is factory fitted to all single phase heat pumps incorporating stainless steel hot water tanks.
- The position lists show the components and parts included in the delivery in *italics*.

Selecting the heating system

The heat pump is set to VL system on delivery, that is with an integrated electrical auxiliary heater and an exchange valve after the auxiliary heater.

What determines which of the three systems VL, D or VLD should be used is, among other things, how any auxiliary heater is used for hot water production, and which model of heat pump is used.

6.1 VL system

In a VL system the heat pump can produce both heating and hot water with the compressor and the integrated auxiliary heater.

Production of heating and hot water cannot occur at the same time because the exchange valve for heating/hot water is positioned after the auxiliary heater.

DHP-H, -C, -A, DHP-H Opti Pro, connection diagram VL system

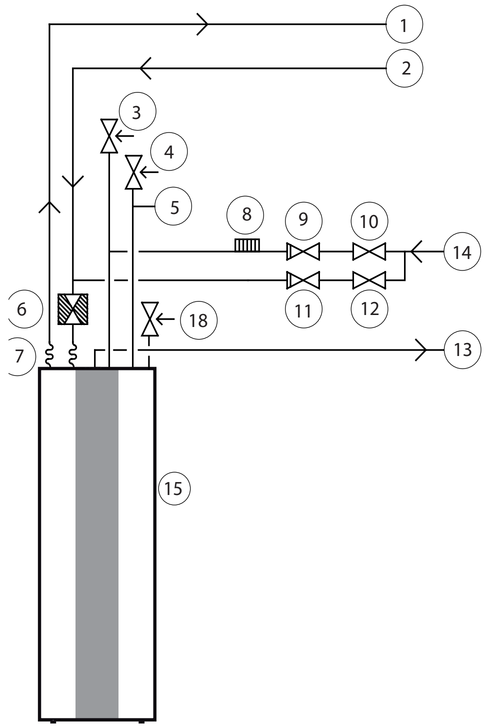


Figure 41: General connection diagram DHP-H, -C, -A, DHP-H Opti Pro.

Position	Name
1	Supply line
2	Return line
3	*Safety valve cold water (9 bar) (included in delivery)*
4	Safety valve expansion heating system
5	Expansion heating system
6	*Strainer (part of the delivery)*
7	*Flexible hoses (part of the delivery)*
8	Vacuum valve
9	Non-return valve
10	Shut-off valve
11	Non-return valve
12	Shut-off valve
13	Hot water
14	Cold water
15	*Heat pump (part of the delivery)*
16	Pressure gauge
17	Expansion outlet Brine DHP-A
18	Safety valve for temperature and pressure (only applies to certain markets)
19	Safety valve for temperature and pressure (only applies to certain markets)

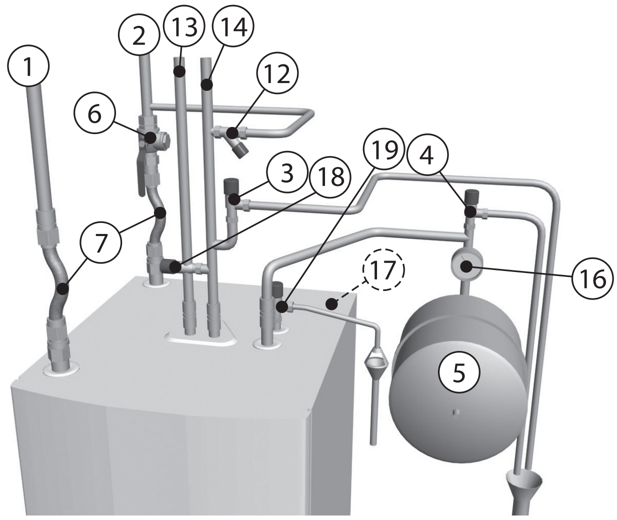


Figure 42: Principal pipe connection DHP-H, -C, -A, DHP-H Opti Pro..

DHP-L, connection diagram VL system

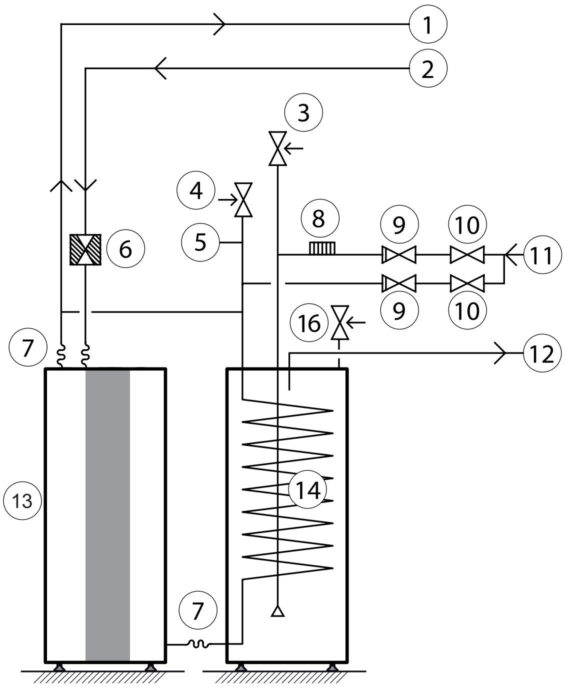


Figure 43: General connection diagram DHP-L.

Position	Name
1	Supply line
2	Return line
3	*Safety valve cold water (9 bar) (included in delivery)*
4	Safety valve expansion heating system
5	Expansion heating system
6	*Strainer (part of the delivery)*
7	*Flexible hoses (part of the delivery)*
8	Vacuum valve
9	Non-return valve
10	Shut-off valve
11	Cold water
12	Hot water
13	*Heat pump (part of the delivery)*
14	Water heater
15	Manometer (not included
16	Safety valve for temperature and pressure (only applies to certain markets))

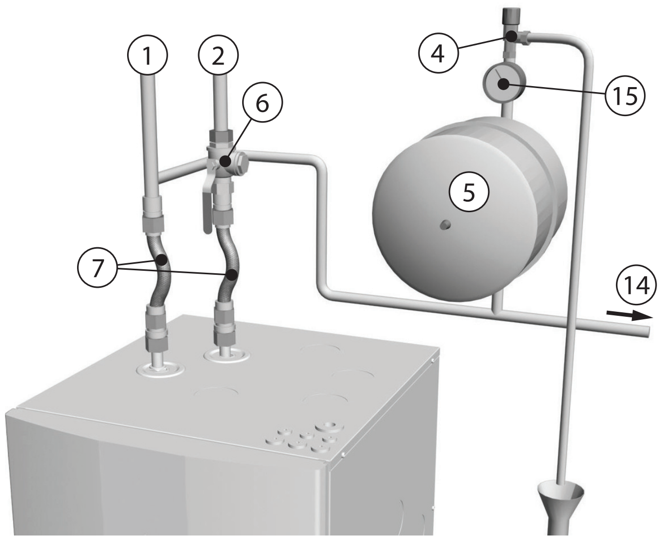


Figure 44: Principal pipe connection DHP-L.

DHP-AL, connection diagram VL system

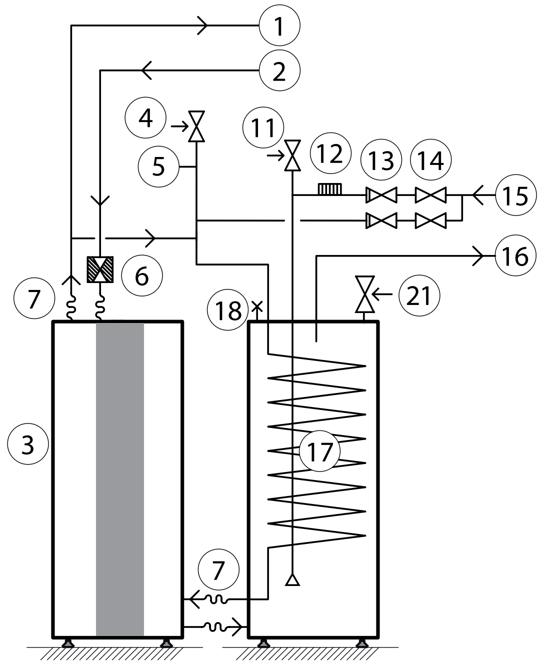


Figure 45: General connection diagram DHP-AL.

Position	Name
1	Supply line
2	Return line
3	*Heat pump (part of the delivery)*
4	Safety valve
5	Expansion tank
6	*Strainer (part of the delivery)*
7	*Flexible hoses (part of the delivery)*
11	*Safety valve (9 bar) (included in delivery)*
12	Vacuum valve
13	Non-return valve
14	Shut-off valve
15	Cold water
16	Hot water
17	*Water heater (part of the delivery)*
18	Bleed valve at stainless steel water heater
19	Pressure gauge
20	Filler cock and non-return valve
21	Safety valve for temperature and pressure (only applies to certain markets)

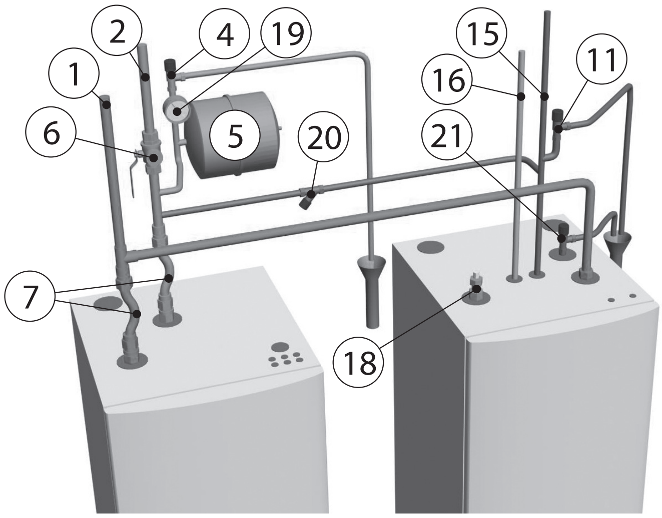


Figure 46: Principal pipe connection DHP-AL.

6.2 D system, DHP-L

With a DHP-L in a D system, the heat pump can produce both heating and hot water with the compressor and an external auxiliary heater (oil boiler, electric boiler, district heating or similar) that is located after the exchange valve replaces the integrated auxiliary heater to produce heat.

The cables for the integrated auxiliary heater must be disconnected, which means that the heat pump cannot carry out peak heat charging (legionella function). Peak heat charging must take place with an electric heating element that is integrated in the water heater or with an electric heating element on the supply line to the water heater.

The heat pump control computer also controls an additional shunt.

DHP-L, connection diagram D system

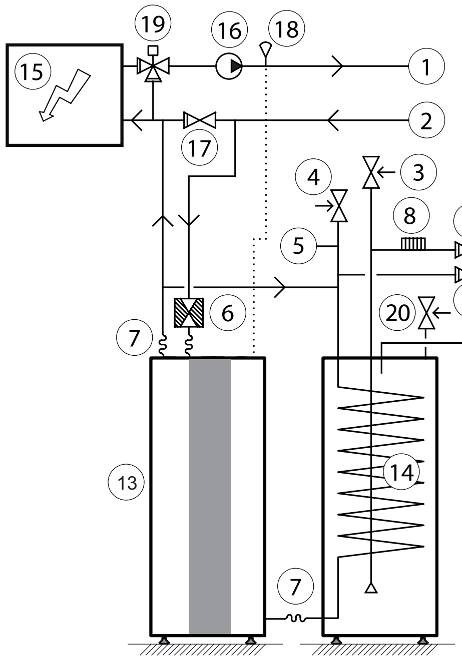


Figure 47: General connection diagram DHP-L, D system.

Position	Name
1	Supply line
2	Return line
3	*Safety valve cold water (9 bar) (included in delivery)*
4	Safety valve expansion heating system
5	Expansion heating system
6	*Strainer (part of the delivery)*
7	*Flexible hoses (part of the delivery)*
8	Vacuum valve
9	Non-return valve
10	Shut-off valve
11	Cold water
12	Hot water
13	*Heat pump (part of the delivery)*
14	Water heater
15	External auxiliary heater
16	Circulation pump
17	Non-return valve
18	*Moved supply line sensor (included in heat pump)*
19	Auxiliary shunt
20	Safety valve for temperature and pressure (only applies to certain markets)

6.3 VLD system, DHP-A, -AL

A VLD system is largely similar to a VL system, but with an external auxiliary heater (often a boiler that is fired with solid fuel) in combination with a DHP-A or DHP-AL.

DHP-A's integrated exchange valve is replaced by an exchange valve that is located after the external auxiliary heater so that both the heat pump and the auxiliary heater can produce heat and hot water. The integrated exchange valve is disengaged with the flow direction locked towards the heating system.

Production of heating and hot water cannot occur at the same time because the exchange valve for heating/hot water is positioned after the auxiliary heater. The integrated auxiliary heater carries out peak heating charging (legionella function) in those operating modes that permit auxiliary heat.

The heat pump's control computer controls the external additional heater via an output (283) on the defrosting card (factory installed in DHP-A or DHP-AL). The heat pump control computer also controls an additional shunt.

DHP-A, connection diagram VLD system

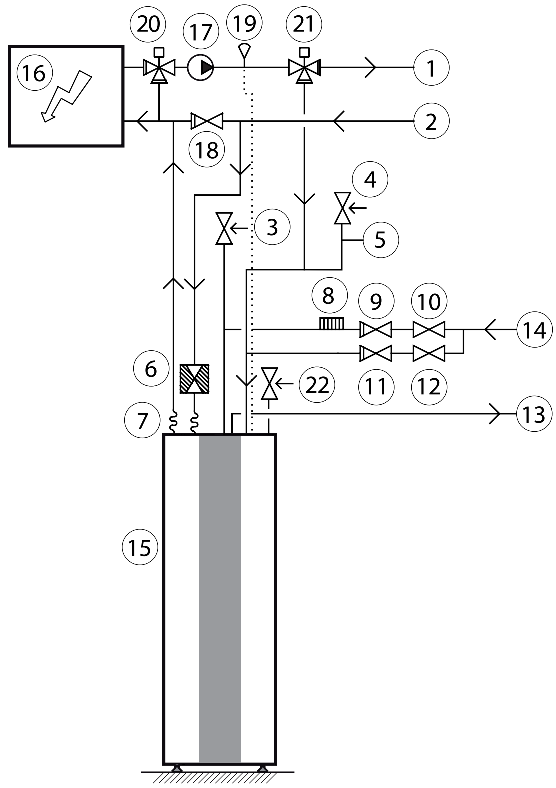


Figure 48: General connection diagram DHP-A, VLD system.

Position	Name
1	Supply line
2	Return line
3	*Safety valve cold water (9 bar) (included in delivery)*
4	Safety valve expansion heating system
5	Expansion heating system
6	*Strainer (part of the delivery)*
7	*Flexible hoses (part of the delivery)*
8	Vacuum valve
9	Non-return valve
10	Shut-off valve
11	Non-return valve
12	Shut-off valve
13	Hot water
14	Cold water
15	*Heat pump (part of the delivery)*
16	External auxiliary heater
17	Circulation pump
18	Non-return valve
19	*Moved supply line sensor (included in heat pump)*
20	Auxiliary shunt
21	External exchange valve
22	Safety valve for temperature and pressure (only applies to certain markets)

DHP-AL, connection diagram VLD

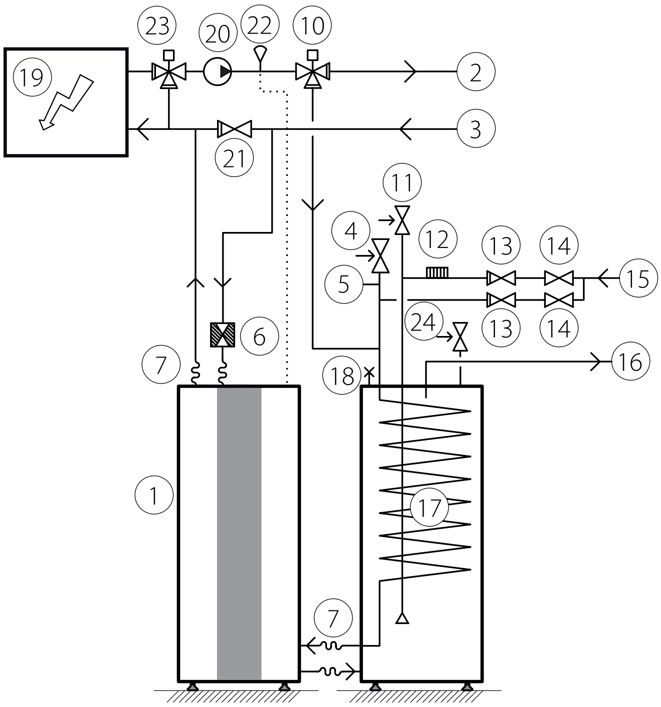


Figure 49: General connection diagram DHP-AL, system VLD.

Position	Name
1	*Heat pump (part of the delivery)*
2	Supply line
3	Return line
4	Safety valve
5	Expansion tank
6	*Strainer (part of the delivery)*
7	*Flexible hoses (part of the delivery)*
8	-
9	Mixer valve
10	Exchange valve
11	*Safety valve (9 bar) (included in delivery)*
12	Vacuum valve
13	Non-return valve
14	Shut-off valve
15	Cold water
16	Hot water
17	*Water heater (part of the delivery)*
18	Bleed valve at stainless steel water heater
19	External auxiliary heater
20	Circulation pump
21	Non-return valve
22	*Moved supply line sensor (included in heat pump)*
23	Auxiliary shunt
24	Safety valve for temperature and pressure (only applies to certain markets)

6.4 Safety valves

⚠ Radiator systems with a closed expansion tank must also be equipped with an approved pressure gauge and safety valve, minimum DN 20, for a maximum 1.5 bar opening pressure, or according to country specific requirements.

⚠ Cold and hot water pipes as well as overflow pipes from safety valves must be made of heat resistant and corrosion-resistant material, e.g. copper. The safety valve overflow pipes must have an open connection to the drain and visibly flow into this in a frost-free environment.

⚠ The connecting pipe between the expansion tank and the safety valve must slope continuously upwards. A continuous upwards slope means that the pipe must not slope downwards from the horizontal at any point.

6.5 Connecting cold and hot water pipes

1. Connect the cold water and hot water pipes with all the necessary components according to the connection diagram for the relevant system.

6.6 Connecting the heating system supply and return lines

All pipes should be routed in such a way that vibrations cannot be transmitted from the heat pump through the piping and out into the building. This also applies to the expansion pipe. To avoid the transmission of vibrations, we recommend that flexible hoses are used for the supply line and return line on both the heating system and brine system sides. Flexible hoses are available to purchase from Danfoss AS. The figures below show how appropriate and inappropriate installations look using this type of hose.

To avoid noise caused by pipe mounting, rubber-coated clamps should be used to prevent the transmission of vibrations. However, installation should not be too rigid and the clamps must not be too tight.

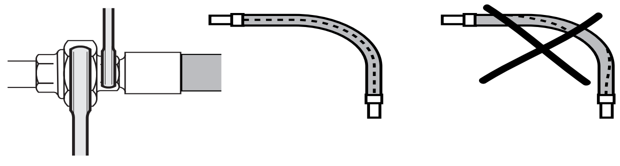


Figure 50: Do not twist the flexible hoses as they are installed. At threaded connections, use a counterhold spanner.

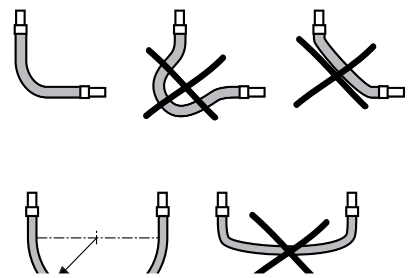


Figure 51: Cut the hose to the correct length to avoid excess bowingout or stretching at bends.

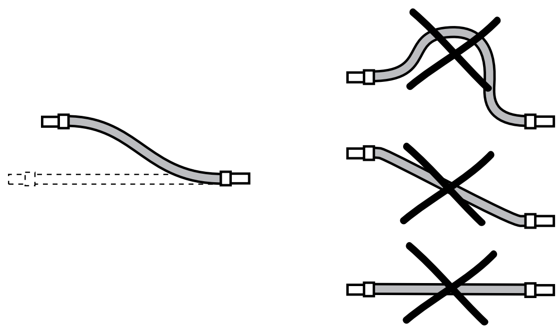


Figure 52: Cut the hose to the correct length to avoid excess bowing-out or stretching and offset the ends so that the hose is not installed completely straight.

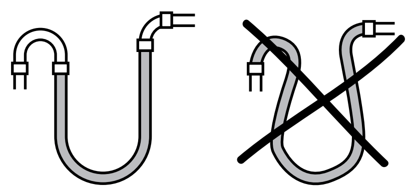


Figure 53: Use fixed pipe bends to avoid excess stress on bends next to connections.

1. Connect the supply line with a flexible hose connection and with all the necessary components.
2. Connect the return line with a flexible hose connection and with all the necessary components including a filter.
3. Insulate the supply and return lines.
4. Connect the expansion tank to the expansion outlet (22mm Cu) on the top of the heat pump.

6.7 Filling the water heater and heating system

1. Fill the water heater with cold water by opening the filler valve (10) which is located on the valve pipe.
2. Bleed by opening one of the hot water taps.
3. Then fill the water heater coil and the heating system with water through the filling valve (12) to a pressure of approx. 1 bar.

6.8 Bleeding the heating system

1. Open all radiator valves fully.
2. Bleed all radiators.
3. Refill the heating system to a pressure of approximately 1 bar.
4. Repeat the procedure until all air has been removed.
5. Leave the radiator valves fully open.

7 Electrical Installation

Electrical current! The terminal blocks are live and can be highly dangerous due to the risk of electric shock. The power supply must be isolated before electrical installation is started. The heat pump is connected internally at the factory, for this reason electrical installation consists mainly of the connection of the power supply.

- Electrical installation may only be carried out by an authorized electrician and must follow applicable local and national regulations.
- The electrical installation must be carried out using permanently routed cables. It must be possible to isolate the power supply using an all-pole circuit breaker with a minimum contact gap of 3 mm. (The maximum load for externally connected units is 2A).
- Electrical connection can also cause noise so this installation must be carried out appropriately. The figure below shows an appropriate installation. There is approximately 300mm free cable between the heat pump and building, however, this requires the cable to be securely installed onto the top panel so that the cable cannot be fed into the heat pump. It is inappropriate to bolt trunking between the heat pump and the wall. This is because vibrations can then be transmitted from the heat pump through the trunking to the walls of the house.
- When the cable is connected to the terminal block a screwdriver is used to open the terminal block, see figure below.

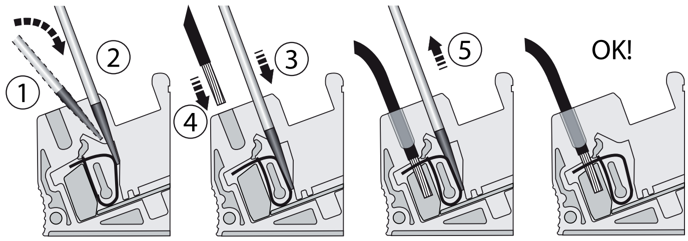


Figure 54: Connecting cable to terminal block.

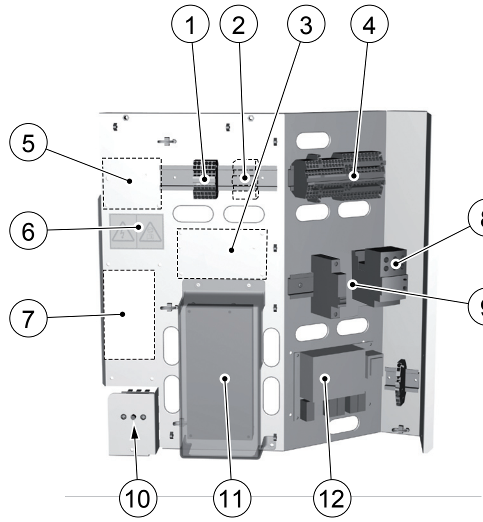


Figure 55: The location of the components on the electrical panel.

Position	Name
1	Terminal block (applies to the expansion card)
2	Terminal block (applies to DHP-A, -AL)
3	Defrost card (applies to DHP-A, -AL)
4	Terminal block
5	Space for Danfoss Online
6	Warning decal
7	Space for expansion card
8	Contactor for compressor
9	Automatic fuses
10	Resetting overheating protection
11	Control computer
12	Soft starter card

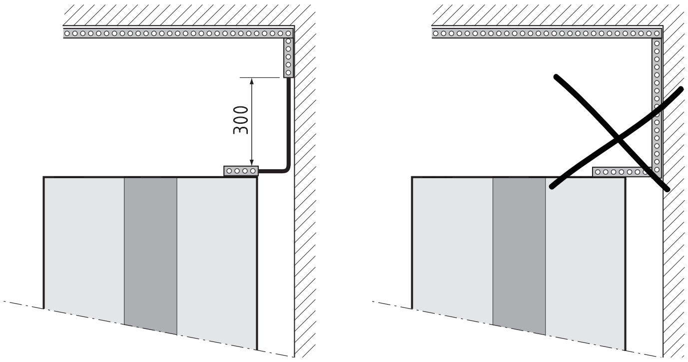


Figure 56: Recommended distance between trunking on the wall and trunking on the heat pump is 300mm.

7.1 Connect power supply, 400V 3N

⚠ NOTE! The power cable may only be connected to the terminal block intended for this purpose. No other terminal blocks may be used!

7.2 Connect power supply, 230V 1N SP

⚠ NOTE! The power cable may only be connected to the terminal block intended for this purpose. No other terminal blocks may be used!

1. Route the power cable through the opening in the top panel of the heat pump to the terminal blocks.
2. Connect the power cable to the terminal block.

7.3 Position and connect outdoor sensors

⚠ NOTE! The outdoor sensor is connected with extra low protection voltage. Follow the specific installation instructions for the outdoor sensor!

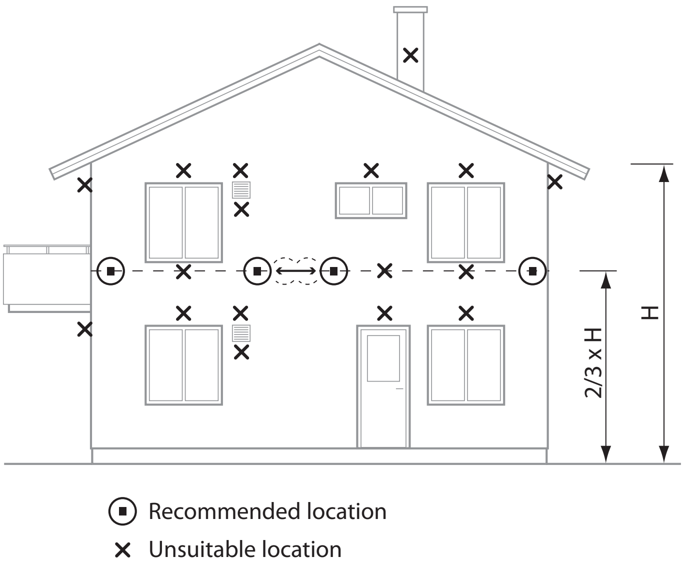


Figure 57: Positioning the outdoor sensor.

- Position the outdoor sensor on the north or north west side of the house.
- To measure the outdoor temperature as accurately as possible, the sensor must be positioned 2/3 of the way up the facade on houses up to three storeys high. For higher buildings, the sensor should be positioned between the second and third storeys. Its location must not be completely protected from the wind but not in a direct draft. The outdoor sensor should not be placed on reflective panel walls.
- The sensor must be positioned at least 1 m from openings in the walls that emit hot air.
- If the sensor cable is connected through a pipe, the pipe must be sealed so that the sensor is not affected by outgoing air.

The outdoor sensor is connected by a two core cable. For a cross section of 0.75 mm^2 a maximum cable length of 50 m applies. For greater lengths a cross section of 1.5 mm^2 is used, up to a maximum of 120 m.

Then connect the sensor to the heat pump control system in accordance with the instructions below.**r.**

1. Route the outdoor sensor connection cable through the cable bushing in the top panel to the terminal block.
2. Connect the sensor to the terminal blocks according to the connection diagram.

7.4 Changing the language in the control computer

If necessary, change the language in the control computer menus.

1. Ensure that the main circuit breaker is on.
2. Open the SERVICE menu by holding ‹ in for five seconds.
3. Change language in the control computer menu SERVICE -> INSTALLATION -> ENGLISH, select language + and – .

7.5 Resetting to system D or VLD

For a description of the different system solutions, see section Piping installation.

The heat pump has VL as factory setting.

For D system, DHP-L:

If D system is selected, the cables for the internal auxiliary heater must be disconnected according to the figure below.

Connect the external auxiliary heater according to the connection diagram below.

For VLD system, DHP-A, -AL:

If the VLD system is selected DHP-A's integrated exchange valve must be limited in open mode to the heating system.

To limit the direction of flow for the exchange valve for the heating system:

1. Ensure that the main circuit breaker is on.
2. Open the SERVICE menu by holding ‹ in for five seconds.
3. Open the control computer menu SERVICE -> MANUAL TEST.
4. Set the value for MANUAL TEST to 1.
5. Set the value for REV.V. HOT WATER to 0.
6. Wait for 15 seconds, disconnect the quick connector at the exchange valve.
7. Set the value for MANUAL TEST back to 0.
8. Connect the external exchange valve cables to the corresponding cables in the disconnected quick connector.
9. Move the supply line sensor out to the position shown in the connection diagram for the VLD system.

In the control computer:

To change to system D or VLD:

1. Ensure that the main circuit breaker is on.
2. Open the SERVICE menu by holding ‹ in for five seconds.
3. Change system in the control computer menu SERVICE -> INSTALLATION -> SYSTEM -> HEATING SYSTEM, select system with + and –.

7.6 Changing the number of auxiliary heating power stages

⚠ NOTE! Setting the maximum permitted number of power stages for the auxiliary heating must be carried out.

1. Ensure that the main circuit breaker is on.
2. Open the SERVICE menu by pressing ‹ for five seconds.
3. Change the number of auxiliary heating power stages in the control computer menu SERVICE -> ADD.HEAT -> MAXSTEP, select the number of stages – and +.

7.7 Connect outdoor unit, DHP-A, -AL

⚠ NOTE! The power cable may only be connected to the terminal block intended for this purpose. No other terminal blocks may be used!

For correct connection between the heat pump and the outdoor unit, 8 connections must be made, see also separate sheet with electrical connections.

1. Route the power cable through the opening in the top panel of the heat pump to the terminal blocks.
2. Connect the power cable to the terminal block.

8 Brine installation

8.1 Heat sources

Bedrock heat

To use rock as the heat source one or more boreholes is/are drilled and the brine hose is lowered into it/them. The hole is filled with water and a fitting with a weight is fastened to the hose before it is lowered.

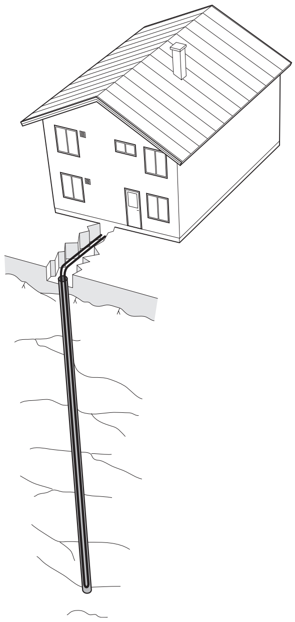


Figure 58: Borehole in rock as heat source.

Lake heat

When lake water is used as the heat source one or more brine coils is/are submerged in the water. The coils must be anchored to the bottom with weights or a net to prevent them floating.

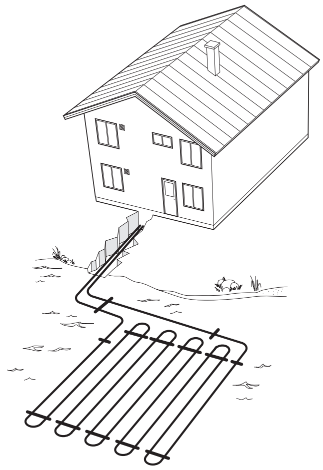


Figure 59: Lake water as heat source.

Groundwater heat

Ground water can be used as a heat source on the condition that there is a sufficiently large flow of ground water in the borehole. A submersible pump is lowered in one hole and pumps up groundwater, which flows through a separate heat exchanger, and is then returned through another borehole. The heat pump has a short brine circuit that works directly against the separate groundwater exchanger.

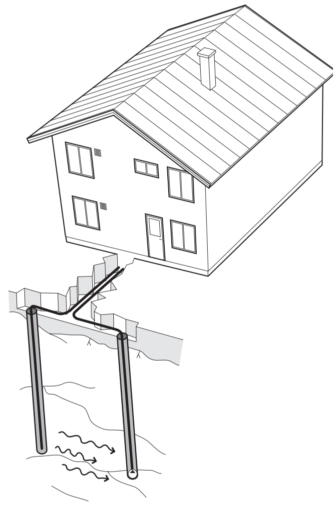


Figure 60: Ground water as heat source.

When ground water is used as a heat source the heat pump installation must be equipped with a flow guard (available as an accessory from the Danfoss range) that stops the heat pump if the flow in the brine pipe is too low, which can create a risk of freezing in the ground water exchanger.

Ground heat

The stored heat energy in the ground can be used as a heat source. In this case a brine loop (or loops) is/are laid under the surface layer of ground.

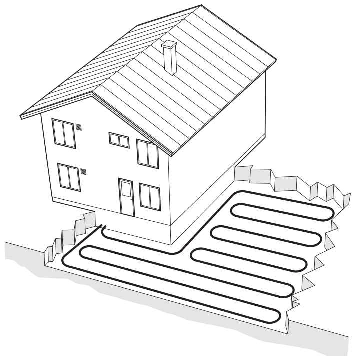


Figure 61: Ground as heat source.

Air heat

The DHP-A and DHP-AL heat pumps are equipped with an outdoor unit that uses outdoor air as a heat source. DHP-A, -AL can make use of the energy in the air outdoors down to temperatures of --20°C. To obtain the correct airflow through the outdoor section it is equipped with a fan.

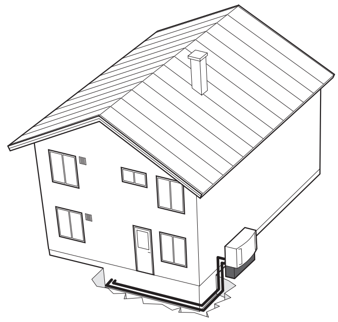


Figure 62: Connecting outdoor unit to use air as heat source.

8.2 Information collector pipe

⚠ Local rules and regulations related to type of collector must be followed.

Borehole collector: Fully welded plastic pipe collector (PEM PN 6.3) according to the applicable local and national regulations with factory manufactured return bend.

Ground collector: Fully welded plastic pipe collector (PEM PN 10) according to the applicable local and national regulations.

In countries where frost damage occurs, the collector pipe beside an outer wall (minimum 2 metres) must be insulated in such a way that frost damage is prevented. This applies regardless of ground, rock or lake heat.

Minimum shaft depth between the energy well and the building is 0.5 m. If burial to that depth is not possible the pipes must be protected against any external mechanical damage.

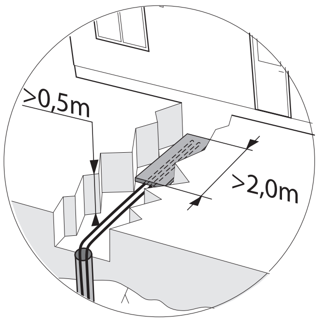


Figure 63: Shaft depth for, and insulation of, collector hoses.

8.3 Connection to outdoor unit

Connection for the brine circuit from the heat pump to the outdoor unit can be carried out using pipes or hoses. Depending on what connection is selected and what diameter the connection has, there is a maximum length that the connection may be. The maximum lengths in the table below are based on ethylene glycol (which is mixed to anti-freeze protection down to -32°C) at 0°C.

DHP-A, -AL	P_{ytg}	Calculated maximum coil length between the HP and outdoor unit, in metres			
Size	**kPa**	**Cu22 $Ø_{in}$ = 20.0**	**Cu28 $Ø_{in}$ = 25.6**	**PEM DN 25 $Ø_{in}$ = 21.0**	**PEM DN 32 $Ø_{in}$ = 28.0**
6	30	34 (2 x 17)	133 (2 x 66.5)	48 (2 x 24)	173 (2 x 86.5)
8	63	21 (2 x 10.5)	98 (2 x 49)	30 (2 x 15)	150 (2 x 75)
10	50	*11 * (2 x 5.5)*	47 (2 x 23.5)	*13 * (2 x 6.5)*	78 (2 x 39)
12	43	*5 * (2 x 2.5)*	26 (2 x 13)	*8 * (2 x 4)*	44 (2 x 22)

**) Not recommended because of high liquid speeds with risk of corrosion/noise problems.*

8.4 Connection of several brine coils

When several brine coils are used for a heat pump installation, regardless of what heat source is used, the length of the coils must not exceed the values in the following tables. The coil lengths are based on ethanol 30% at 0°C.

For hoses of type PEM DN 32, Øi = 28,0:

DHP-H, -C, -L	P_{ytg}	Calculated maximum coil length per coil, in metres			
Size	**kPa**	**1 coil**	**2 coils**	**3 coils**	**4 coils**
6	31	182	2 x 443	3 x 620	4 x 775
8	33	94	2 x 220	3 x 471	4 x 660
10	67	129	2 x 419	3 x 670	4 x 1117
12	64	91	2 x 376	3 x 640	4 x 914
16	56	37	2 x 165	3 x 329	4 x 400

For hoses of type PEM DN 40, Øi = 35,2.

DHP-H, -C, -L	P_{ytg}	Calculated maximum coil length per coil, in metres			
Size	**kPa**	**1 coil**	**2 coils**	**3 coils**	**4 coils**
6	31	517	2 x 775	3 x 1033	4 x 1033
8	33	367	2 x 660	3 x 943	4 x 825
10	67	394	2 x 1340	3 x 1675	4 x 1675
12	64	291*	2 x 1067	3 x 1280	4 x 1600
16	56	119	2 x 560	3 x 933	4 x 1120

**) When dimensioning size 12, a borehole depth that exceeds this recommendation for coil length is often required. In such cases two coils should be used.*

The different brine coils are distributed from a common collection well. All return lines are led back to the well and are equipped with choke valves because the flow of each individual coil must be adjusted.

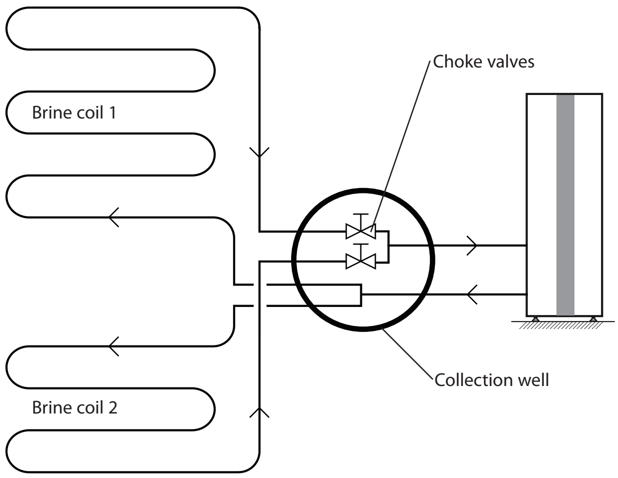


Figure 64: The collection well for distributing to several brine coils.

Choke valves with flow indicators (available as accessories from the Danfoss range) are used to adjust the brine flow so that it is the same in all coils.

If choke valves with flow indicators are not available adjust the valves until the temperature of all the coil return hoses is the same.

8.5 Connection diagram

The position lists show the components and parts included in the delivery in *italics*.

DHP-C:

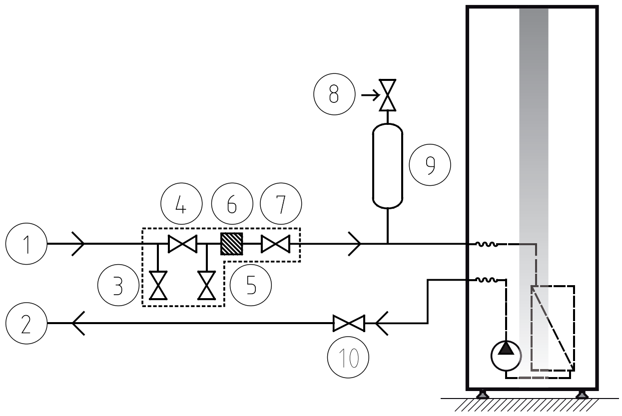


Figure 65: General connection diagram brine pipes, DHP-C.

Position	Name
1	Brine in
2	Brine out
3	*Shut-off valve*
4	*Shut-off valve*
5	*Shut-off valve*
6	*Strainer*
7	*Shut-off valve*
8	*Safety valve (1.5 bar)*
9	*Bleed and expansion tank*
10	Shut-off valve

DHP-H, DHP-L:

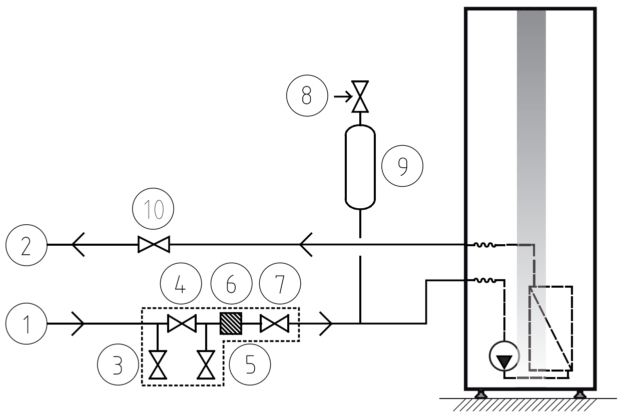


Figure 66: General connection diagram, brine pipes DHP-H, DHP-L.

Position	Name
1	Brine in
2	Brine out
3	*Shut-off valve*
4	*Shut-off valve*
5	*Shut-off valve*
6	*Strainer*
7	*Shut-off valve*
8	*Safety valve (1.5 bar)*
9	*Bleed and expansion tank*
10	Shut-off valve

DHP-A:

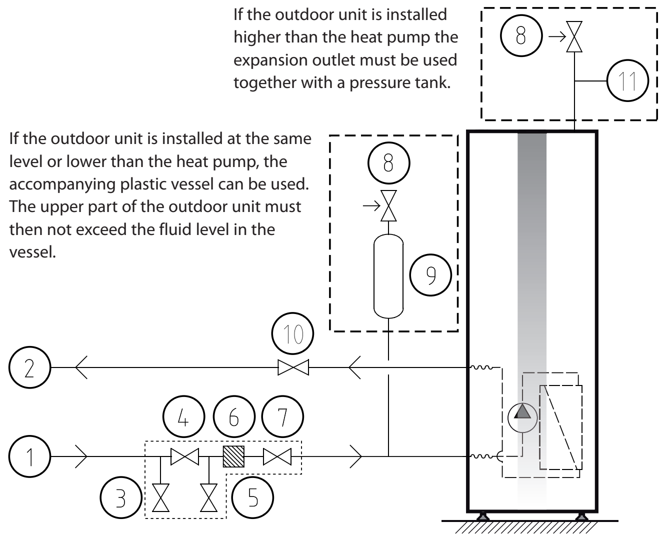


Figure 67: General connection diagram brine pipes, DHP-A.

Position	Name
1	Brine in
2	Brine out
3	*Shut-off valve*
4	*Shut-off valve*
5	*Shut-off valve*
6	*Strainer*
7	*Shut-off valve*
8	*Safety valve (1.5 bar)*
9	*Bleed and expansion tank*
10	Shut-off valve
11	Pressure tank

Outdoor unit:

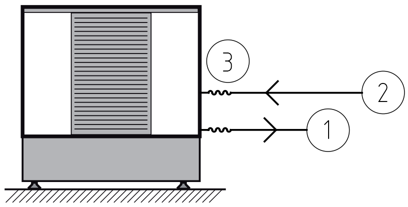


Figure 68: Connection diagram, DHP-A -AL outdoor unit

Position	Name
1	Brine out
2	Brine in
3	Flexible hoses

DHP-AL:

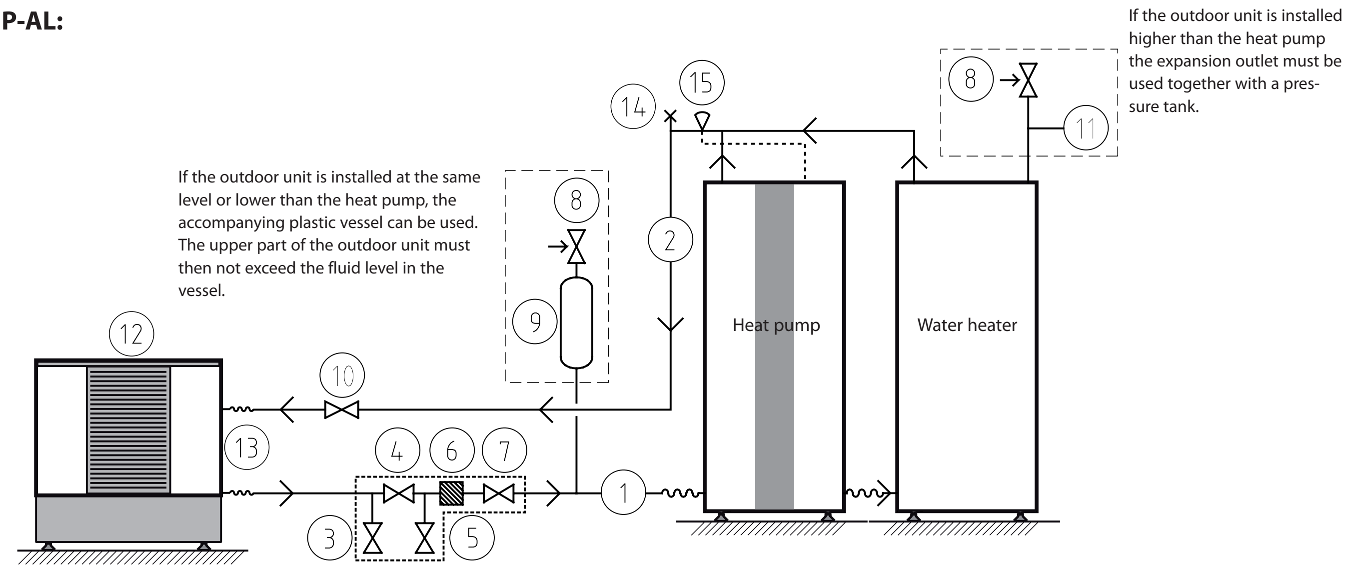


Figure 69: Connection diagram for brine pipes.

Position	Name
1	Brine in
2	Brine out
3	Shut-off valve (part of the filler cock)
4	Shut-off valve (part of the filler cock)
5	Shut-off valve (part of the filler cock)
6	Strainer (part of the filler cock)
7	Shut-off valve (part of the filler cock)
8	Safety valve (1.5 bar)
9	Bleed and expansion tank
10	Shut-off valve
11	Pressure tank
12	Outdoor unit
13	Flexible hoses
14	Bleed valve
15	Moved out supply line sensor, brine

8.6 Installing brine pipes

1. Determine to which side the brine pipes are to be connected.
2. Route the out pipe for brine in through the corresponding hole (with rubber collar) in the heat pump side.
3. Install all necessary components on the pipe.
   Remember to install the filler cock with the filter cover upwards.
4. Route the out pipe for brine out through the corresponding hole (with rubber collar) in the heat pump side.

⚠ When the brine lines are connected to the right for DHP-A, the brine out line must be routed over the brine pump, under the compressor's vacuum pipe and under the condenser's flexible hose, see figure below.

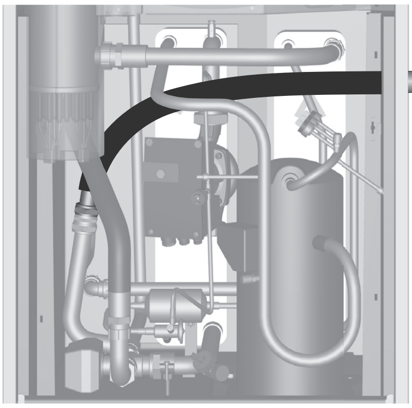


Figure 70: Routing of pipes for brine out for DHP-A.

5. Install the out pipe with all the accompanying components.
6. Install the expansion tank with the safety valve.
7. Fit both brine pipes with anti-diffusion insulation running all the way from the heat pump to the lead-in in the wall. The brine pipes running outside the house to the collector can be buried, however they must be well insulated.

⚠ Applies to DHP-A, -AL: Bear in mind that the outdoor unit may move during defrosts, use flexible hoses to connect the pipes from the heat pump and pipes on the outdoor unit.

8.7 Filling the brine system

⚠ NOTE! Before filling the brine system, the electrical installation must be completed so that it is possible to operate the brine pump.

⚠ NOTE! Before filling the brine system for DHP-A, -AL, the water heater **MUST** be filled.

⚠ NOTE! Always check local rules and regulations before using anti-freeze.

⚠ NOTE! Anti-freeze with corrosion protection additives must be used and mixed to achieve frost protection down to -15°C for models Diplomat and Comfort.

⚠ NOTE! Use only ethylene glycol as anti freeze for DHP-A and DHP-AL, mixed to achieve frost protection down to -32°C.

Calculated volume, DHP-H, -C, -L

The volume of the brine system is calculated as follows:

- Heat pump (exchanger and piping) approximately 2 litres
- Expansion tank approximately 3 litres
- Collector (single pipe): PEM 40 approximately 1.0 litre/m; PEM 32 approximately 0.6 litre/m; Cu 28 approximately 0.5 litre/m

Calculated volume, DHP-A, -AL

The volume of the brine system is calculated as follows:

- Heat pump (exchanger, pipe and outer jacket) approximately 47 litres
- Expansion tank approximately 3 litres
- Outdoor unit approximately 7 litres
- Collector (single pipe): 28 mm pipe approx. 0.5 litre/m

Filler cock

When the filler cock is installed on the return line, remember to turn the strainer cover upwards in order to minimise the amount of air that gets into the brine system when cleaning the filter.

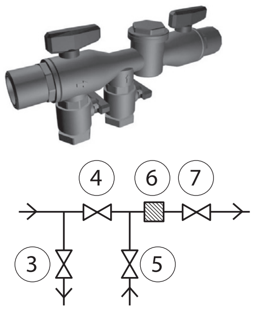


Figure 71: Filler cock.

Position	Name
3	Shut-off valve
4	Shut-off valve
5	Shut-off valve
6	Strainer
7	Shut-off valve

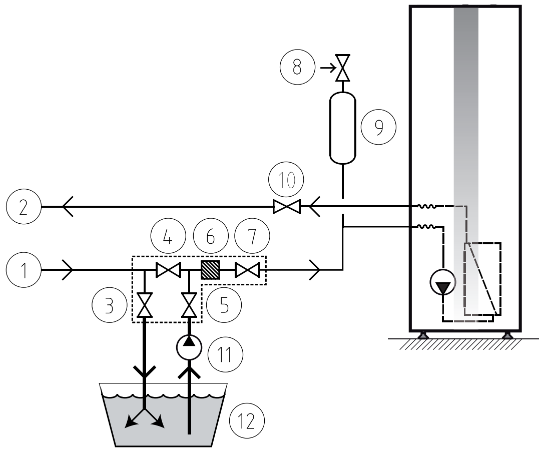


Figure 72: Filling the brine system

Position	Name
1	Brine out
2	Brine in
3	Shut-off valve (part of the filler cock)
4	Shut-off valve (part of the filler cock)
5	Shut-off valve (part of the filler cock)
6	Strainer (part of the filler cock)
7	Shut-off valve (part of the filler cock)
8	Safety valve 1.5 bar
9	Bleed and expansion tank
10	Shut-off valve
11	External pump
12	External container

1. Set the heat pump operating mode to "OFF" in the control computer menu INFORMATION -> OPERAT.
2. Mix water and anti-freeze in the correct proportions in an external container (12). Note that each pack must be well mixed.
3. Check that the freezing point of the mixture is reached using a refractometer (-15°C for DHP-H, -C, -L)(-32°C for DHP-A, -AL).
4. Fill the system with the mixture using an external pump (11) which can bleed the brine pipes. Connect the pressure side of the pump to the filler connection at valve (5).
5. For DHP-A, -AL: Open the defroster shunt in the control computer menu SERVICE -> MANUAL TEST -> SHUNT DEFR, set the value to -.
6. Close valve (4).
7. Open valves (5) and (10).
8. Connect a transparent hose (3) that opens out into the external container (12).
9. Open valve (3).
10. Start the external pump (11) and fill the brine pipes.
11. Start the brine pump manually in the control computer menu SERVICE -> MANUAL TEST -> BRINEPUMP, set the value to 1.
12. Run the brine pump and the external pump (11) in series until fluid, clear of air, comes out of the return hose from the valve (3).
13. Stop the brine pump in the control computer menu SERVICE -> MANUAL TEST -> BRINEPUMP, set the value to 0, at the same time leave the external pump running.
14. Open valve (4) with the external pump running to eliminate the air between the valves (3) and (5).
15. Close valve (3) and pressurise the system using the external pump. **NOTE! Max. 150kPa, (1.5bar)**.
16. Close valve (5).
17. For DHP-A, -AL: close the defroster shunt in the control computer menu SERVICE -> MANUAL TEST -> SHUNT DEFR, set the value to 0.
18. Stop the external pump (11) and disconnect the filling equipment.
19. Install insulation on the filler cock.

8.8 Bleeding the brine circuit

⚠ NOTE! When topping up, the brine pump must be running.

1. Start the brine pump in the control computer menu SERVICE -> MANUAL TEST -> BRINEPUMP, set the value to 1.
2. Check that the level in the bleed tank (9) is stabilised.
3. Dismantle the safety valve (8) on the bleed tank.
4. Top up with brine to 2/3 of the tank through the connection on which the safety valve (8) was installed.
5. Leave the brine pump running so that that the air in the system collects in the bleed tank.
6. As air separates in the bleed tank the fluid level drops, top up as in step 4.
7. Reinstall the valve (8) when all air has been removed from the system.
8. Open valve (8) and release any overpressure. The fluid level should not fall below 2/3 of the height of the tank.
9. Check that valve (3) is closed.
10. Stop the brine pump in the control computer menu SERVICE -> MANUAL TEST -> BRINEPUMP, set the value to 0.
11. Switch to the desired operating mode if the heating system has been filled and bled.

Collect any excess brine in a plastic container for topping up the system if necessary (leave it with the customer).

8.9 Vent outdoor unit, DHP-A, -AL

If the outdoor unit is installed higher than the heat pump with a pressurised brine system, the outdoor unit ***must*** be bled using the bleed screws on the connection pipes.

The side covers of the outdoor unit must be removed to access the bleed screws.

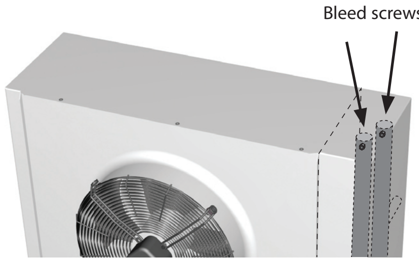


Figure 73: Bleed screw locations.

If the outdoor unit is installed at the same level or lower than the heat pump it is recommended that the brine circuit in the outdoor unit is also bled.

9 Installing accessories/additional functions

9.1 Room temperature sensor

The room temperature sensor has a temperature sensor that provides a further value that the control computer can use when calculating the supply temperature. The influence of the room sensor in the calculation can be set in the menu HEAT CURVE-> ROOM FACTOR. Default setting for ROOM FACTOR is 2 but can be adjusted from 0 (no impact) to 4 (large impact).

The difference between the desired and actual indoor temperature is multiplied by the set value for ROOM FACTOR. The set point on the heating system's supply line increases or decreases with the result depending on whether there is a deficit or surplus of heat.

The table below shows examples of how the set point for the supply line is affected at CURVE 40 with different settings for ROOM FACTOR.

In the event of a heating deficit:

ROOM FACTOR	Desired room temperature, °C	Actual room temperature, °C	Set point for supply line, °C
0	22	20	40
1	22	20	42
2	22	20	44
3	22	20	46
4	22	20	48

In the event of a surplus of heat the conditions are the opposite:

ROOM FACTOR	Desired room temperature, °C	Actual room temperature, °C	Set point for supply line, °C
0	20	22	40
1	20	22	38
2	20	22	36
3	20	22	34
4	20	22	32

NOTE! The room temperature sensor is connected to a safety extra-low voltage.

1. Install the room temperature sensor in a location in the house where the room temperature is relatively constant:
   - Centrally located in the house
   - At eye level
   - Not in direct sunlight
   - Not in a draft
   - Not in a room with alternative heating
2. Hang a thermometer next to the room temperature sensor in order to calibrate it after connecting it.
3. Connect the room temperature sensor to terminal blocks 303 and 304.
4. After connecting the room temperature sensor, it is calibrated by holding in both buttons for 15 seconds until the display starts to flash.
5. Set the actual room temperature that the thermometer shows.
6. Wait 10 seconds until the display stops flashing.

If the display shows "--" for outdoor temperature no outdoor temperature has been read.

9.2 EVU function

The EVU function prevents the operation of HEATPUMP, ADD.HEAT and CIRC.PUMP as long as the contact is closed. The text EVU STOP is shown in the display when this function is active.

- The EVU function is activated by making a connection between terminal blocks 307 and 308 using an external 1-pin timer.

9.3 Tariff control

The room temperature lowering function provides a regular, temporary lowering of the indoor temperature.

- The tariff control is activated by making a connection between terminal blocks 307 and 308 using an external 1-pin timer and a 10 kohm resistor.
- The extent to which the temperature is lowered is set in the menu INFORMATION -> Heatcurve -> REDUCTION.

9.4 Flow switch/level switch

In certain countries there is a requirement that the heat pump must be equipped with a level switch for the brine system. Always check local rules and regulations before commissioning the heat pump.

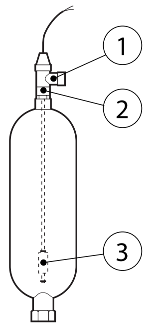


Figure 74: Level switch in the expansion tank/bleed tank.

Position	Name
1	Safety valve
2	Level switch
3	Floats

- Connect the flow switch or level switch to terminal blocks 217 and 219.

9.5 Higher hot water temperature

Does not apply to models with refrigerant R134a, models DHP-C -4H, -5H and -7H.

NOTE! Never connect the heat pump to provide a higher temperature unless the heating or hot water systems require it. Higher temperatures increase the load on the heat pump.

If necessary, the heat pump can be connected to produce hotter water for the heating system and hot water system when it is installed.

Figure 75: The pressure switches on the compressor's pressure pipe.

1. Move the grey cables, which are normally connected to pressure switch A, to pressure switch B.

10 Start up

NOTE! Read the safety instructions!

⚠ The installation may only be commissioned if the heating system, water heater and brine system have been filled and bled. Otherwise the circulation pumps may be damaged.

⚠ If the installation is only to be run on auxiliary heating, first ensure that the heating system is filled and bled and that neither the brine pump nor the compressor can be started. This is carried out by setting the operating mode to ADD.HEAT.

⚠ Any alarms that may occur in connection with the installation can be fault-traced in the “Troubleshooting” section in the service instructions.

⚠ For DHP-H Opti Pro SP (Single Phase) heat pumps it is imperative that the maximum hot water temperature is altered from the default factory setting from 95C to 85C. Refer to Chapter 14.2 menu Service – HGW Parameter MAX TEMP.

10.1 Installation checklist

Before manual test operation check the following points:

Piping installation, heating system

- Pipe connections in accordance with the connection diagram
- Flexible hoses on the supply and return lines
- Pipe insulation
- Strainer on return line, heating system
- Bleeding of the heating system
- All radiator valves fully open
- Expansion tank heating system (not included in the delivery)
- Safety valve for expansion tank (not included in the delivery)
- Filler cock heating system (not included in the delivery)
- Leakage inspection

If a an external water heater is installed, also check:

- Exchange valve
- Safety valve for cold water (9 bar)

Electrical Installation

- Circuit-breaker
- Fuse protection
- Direction of rotation of the compressor
- Coolant pump
- At DHP-A, -AL, outdoor unit
- At DHP-A, -AL, defroster sensor
- Positioning of the outdoor sensor
- Control computer settings

If a an external water heater is installed, also check:

- Exchange valve

Brine system

- Expansion/bleed tank on brine in
- Safety valve for expansion tank
- Filler connector on brine in
- Insulation in the outside wall lead-in
- Other brine pipe insulation
- Bleeding of brine system
- Leakage inspection

10.2 Manual test

Test operate and at the same time check the function of the tested components.

Activate MANUAL TEST

1. Ensure that the main circuit breaker is on.
2. Select operating mode ⏻ , in the menu INFORMATION -> OPERAT.-> ⏻
3. Open the SERVICE menu by holding ‹ in for five seconds.
4. Set the value for MANUAL TEST to 2.

⚠ NOTE! Select position 2 to navigate away from the MANUAL TEST menu during ongoing test operation!

Test the brine pump

5. Start the brine system’s brine pump by setting the value BRINEPUMP to 1.
6. Check that the brine pump is running by:

- listening
- putting a hand on the pump
- checking that the level in the expansion tank is stable. If the level is not stable there is air in the system.
- listen for air

7. If the pump does not start see the section, “Starting circulation pumps manually”.
8. If there is air in the brine system, bleed according to section, “Bleeding the brine system”.
9. Stop the brine pump by setting the value to 0.

Test the circulation pump

10. Start the heating system circulation pump by setting the value CIRC.PUMP to 1.
11. Check that the circulation pump is running by:

- listening
- putting a hand on the pump
- listen for air

12. If the pump does not start see the section, “Starting circulation pumps manually”.
13. If there is air in the heating system, bleed according to section, “Bleeding the heating system”.
14. Stop the circulation pump by setting the value to 0.

Test the exchange valve

15. Activate the 3-way valve by setting the value VXV WARMWATER to 1.
16. Check that the arm on the 3-way valve changes position.
17. If the arm does not change position, see the “Troubleshooting” section in the service instructions.

Test the compressor

18. Start the circulation pump by setting the value CIRC.PUMP to 1
19. Start the heat pump compressor by setting the value HEATPUMP to 1. At the same time as the value is set to 1 for HEAT PUMP the brine pump also starts.

⚠ NOTE! Risk of burns, the delivery line on the compressor can reach 70-80°C!

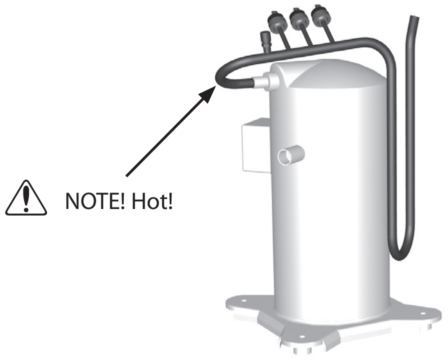


Figure 76: The pressure pipe should get hot during operation.

20. Check that:
- the compressor is running in the right direction by putting a hand on the pressure pipe and checking that it is hot.
- it sounds normal and there is no noise.

21. If the pipe does not get hot, or if it sounds abnormal, see the “Troubleshooting” section in the service instructions.
22. Stop the compressor by setting the value to 0.
23. Stop the brine pump by setting the value to 0.
24. Stop the circulation pump by setting the value to 0.

Testing the auxiliary heating power stages

25. Start the circulation pump by setting the value CIRC.PUMP to 1
26. Start the first auxiliary heating power stage by setting the value ADD.HEAT 1 to 1.
27. Check that the auxiliary heating power stage works by leaving the menu MANUAL TEST and going into the menu INFORMATION -> TEMPERATURE -> SUPPLY and check that the temperature rises.
28. Return to the menu MANUAL TEST and stop ADD.HEAT 1 by setting the value back to 0.
29. Repeat steps 26 to 28 for ADD.HEAT 2 and ADD.HEAT 3.
30. Stop the circulation pump by setting the value to 0.

Test fuse protection

31. Start the circulation pump by setting the value CIRC.PUMP to 1
32. Start the compressor by setting the value HEATPUMP to 1.
33. At the same time, start the auxiliary heating power stages available to check that the fuse protection can withstand full power operation.
34. Stop the auxiliary heating power stages and the compressor by setting the value back to 0.
35. Stop the circulation pump by setting the value to 0.

Test the outdoor unit for DHP-A, -AL

36. Start the defroster shunt by setting the value SHUNT DEFR to 1.
37. Start the fan at low speed by setting the FAN L value to 1. Check that the fan runs at low speed.
38. Start the fan at high speed by setting the FAN H value to 1. Check that the fan runs at high speed.

Exit test operation

39. Set the value for MANUAL TEST to 0.

10.3 Commissioning

Starting circulation pumps manually

If any of the circulation pumps do not start, it may need to be helped as follows:

Figure 77: Bleed screw location.

1. Open and remove the bleed screw on the front of the pump. Normally a small amount of water comes out when it is removed.
2. Insert a flat blade screwdriver and turn it in the direction of rotation of the pump (clockwise).
3. Reinstall the bleed screw with its rubber seal.

Adaptation to the heating system

Adjust the heat pump settings to the applicable heating system, for instance an underfloor heating or radiator system. The delta temperature must be at least 8°C above the heat pump. The delta temperature should be 3-5°C for the brine system. If none of the delta temperatures are reached, the flow of the circulation pumps may need adjusting depending on the applicable heating system.

Noise check

During transportation and installation there is a certain risk that the heat pump can be damaged, components may move or get bent and this can cause noise. Because of this it is important to check the heat pump when it has been installed and is ready to be commissioned to ensure that everything seems in order. The heat pump should be run in both heating and hot water modes to ensure that there is no abnormal noise. While doing this, check that there is no abnormal noise in other parts of the house.

Noise is produced from the outdoor unit when the fan is in operation, check during that manual operation that there is no disturbance in your own home as well as to any neighbours. A noise kit is available for purchase for the outdoor unit for DHP-A 10 and 12 if it is necessary to reduce the noise.

Select operating mode

Set the heat pump to the desired operating mode in the menu INFORMATION -> OPERAT. If necessary, set certain parameters in the control computer, such as ROOM and CURVE.

10.4 Installing the front cover

⚠ NOTE! Take care not to damage the front cover!

1. Align the upper section of the front cover with both the side channels at the top of the unit and slide it carefully downwards until it covers the entire front of the unit.
2. Tighten the screws.

10.5 After start up

⚠ NOTE! Remember that it takes time for the heat pump to heat a cold house. It is best to let the heat pump work at its own pace and NOT raise or alter any values in the control computer to try to heat it up more rapidly.

⚠ NOTE! If there is an LP alarm in conjunction with installation it usually means that there is air in the system. Normally the alarm disappears after a few days. If the alarm does not stop the brine circuit must be bled and topped up.

11 Customer information

After installation and test operation, the customer must be informed about their new heat pump installation. Below is a checklist regarding the information that the installer must give the customer:

- The model of the heat pump that has been installed
- Run through the Maintenance instructions and show what it contains
- Describe the various operating modes and what they mean
- Describe the most common alarms and corrective actions
- Demonstrate how to navigate the control computer and which settings the customer can set themselves
- Demonstrate how to view history and operating times
- Show the pipe installation and go through the periodic maintenance actions that the customers must be aware of:
  - recommended pressure on manometers
  - fill the heating system
  - exercise safety valves
  - clean strainers
- Explain how the customer can fine adjust their existing heating system according to the instructions in the maintenance instructions
- The applicable warranties
- Where is the customer to turn for servicing
- Finally, fill in the reference list at the back of the Maintenance instructions.

Service instructions

12 The heat pump

12.1 Function description

A heat pump utilises the free energy found in a natural heat source, such as rock, ground, ground water or air. The heat pump can be compared to a reversed refrigerator. In a refrigerator, heat is transferred from the inside of the refrigerator to the outside. In a heat pump the heat that is stored in a heat source is transferred to the inside of the house. The heat pump uses the energy in the heat source and gives back two to three times more heat energy than what it uses in electrical energy. The heat pump is, therefore, a very environmentally friendly and economical way of heating a house.

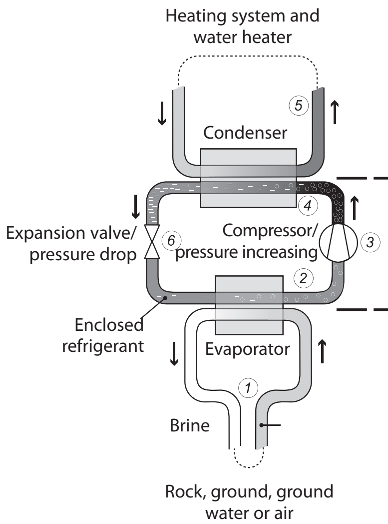
In order for the heat pump to be able to retrieve heating energy from the heat source and transfer it to the heating system of the house, three separate fluid circuits are required.

The circuit that retrieves the heating energy from the heat source is called the brine circuit and it maintains a low outgoing temperature to be heated by the heat source.

The next circuit is called the refrigerant circuit and is a closed circuit which takes the retrieves heating energy and transfers it to the last circuit, the heat transfer fluid circuit.

The heat transfer fluid circuit holds the fluid that circulates in the heating system of the house and transfers heating energy to the house or heat pump's water heater.

The figure below shows how the different circuits work together in the transfer of heating energy.



Heat transfer fluid circuit – is the circuit that contains the water that transports the heat/energy to the heating system and the water heater.

Refrigerant circuit – is the circuit that contains a chlorine and freon free refrigerant which, inside the heat pump, transfers the energy retrieved from the brine circuit through evaporation, compression and condensation, and supplies it to the heat transfer fluid circuit.

Brine circuit – is the circuit that contains an antifreeze water based mix that obtains and transports energy from the heat source to the heat pump. This circuit is also known as the collector.

Figure 78: Function principles of a heat pump.

1 A fluid (brine) filled hose is lowered into a lake, buried in the ground or lowered into bedrock. The brine obtains energy from the heat source by the fluid temperature in the hose being heated a few degrees by the surrounding heat source. The fluid filled hose is also known as a collector.

2 The brine is guided into the heat pump's evaporator. The enclosed refrigerant in the refrigerant circuit is forced to boil as the pressure in the expansion valve drops and later evaporates to a gas in the evaporator. The energy produced during this process is released by the slightly heated brine.

3 The refrigerant that now contains a large quantity of energy in the form of heat is transferred to the compressor, which both increases its temperature and pressure.

4 The refrigerant then continues to the condenser. When condensing, the refrigerant supplies its heat energy to the heat transfer fluid circuit. The refrigerant's temperature decreases and returns to a liquid state.

5 The heat transfer fluid circuit transports the heat energy out to the water heater, radiator and the under floor heating system, which heat up.

6 The refrigerant is then transported through the expansion valve where the pressure drops and the refrigerant starts to boil and then the process starts again.

12.2 Components

The heat pump is a complete heat pump installation for heating and hot water. It has the market's first compressor developed solely for heat pumps. It has an integrated 180 litre water heater and auxiliary heating. TWS stands for Tap Water Stratificator. This technology results in more effective heat transfer and more effective layering of the water in the water heater.

The heat pump is equipped with control equipment, which is controlled via a control panel.

Heat enters the house via a water borne heating system, a low temperature system. The heat pump supplies as much of the heat demand as possible before auxiliary heating is engaged and assists.

The heat pump unit consists of five basic units:

1 **Heat pump unit**
- Scroll compressor
- Stainless steel heat exchangers
- Circulation pumps for brine and heating systems
- Valves and safety equipment for cooling systems and corresponding electrical components.

2 **Water heater**
- 180 litres
- Internal anti-corrosion protection with copper or stainless steel
- It has an anode that does not require replacing, which means that it is maintenance-free

3 **Exchange valve**
- The heated water either passes through to the heating system or to the water heater depending on whether heating or hot water is to be produced

4 **Auxiliary heat**
- 9 kW electric heating element (4.5 kW at 230 V 1N heat pump installation)
- Electric heating element control in maximum of three steps (five steps for 400 V 3N DHP-A, -AL models)
- Installed on the heating system's supply line
- Covers the demand of extra energy if the heat pump's capacity is exceeded
- Automatically connected if operating mode AUTO is selected.

5 **Control equipment**
- Control computer with graphic display
- Temperature sensors (outdoor, supply line, return line, brine and hot water)
- Room sensor (option)

The control equipment controls the heat pup unit's included components (compressor, circulation pumps, auxiliary heaters and exchange valve) and determines when to start and stop the pump as well as producing heat for the house or hot water.

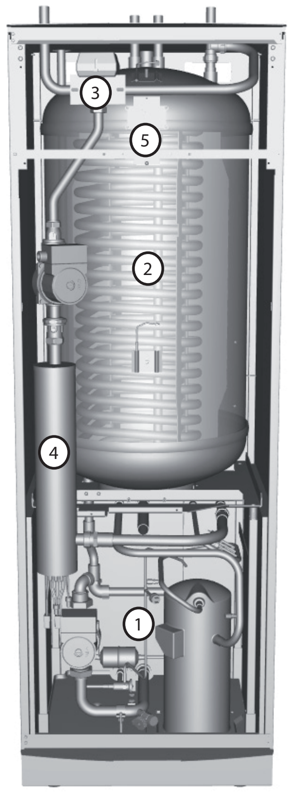


Figure 79: Heat pump components.

12.3 Outdoor unit and defroster function, DHP-A, -AL models

The DHP-A and DHP-AL heat pumps are equipped with an outdoor unit that makes use of the energy in the air outdoors down to -20°C. The outdoor unit has a coil where brine recovers free energy from the outside air. It also has a fan that increases the airflow through the coil. During operation the coil is cooled by the energy exchange at the same time as the humidity causes it to become covered in frost. DHP-A, AL models have an automatic function to defrost the coil using the produced heat energy. If necessary, a defrosting sequence starts which means the following:

- The defrosting sequence starts when the temperature of the brine reaches its set parameter for defrosting.
- The compressor is stopped so that the defrosting sequence should not load the compressor unnecessarily. On the other hand the compressor is not stopped when it produces hot water because the water heater is cooled when defrosting. The fan on the outdoor unit is stopped in conjunction with defrosting to shorten the time of defrosting.
- The shunt valve in the heat pump opens so that hot brine from the defrosting tank is mixed with the cold brine circulating to the outdoor unit. The mixture has a temperature of about 15°C.
- The fifteen degree heated brine melts the frost on the outside of the coil at the same time as the liquid is cooled.
- When the brine is no longer cooled to temperatures below 11°C the coil is sufficiently defrosted.
- The shunt valve closes the flow of hot brine from the defrosting tank.
- Operation returns to normal.

A DHP-A, -AL installation consists of three basic units:

1 **Heat pump unit**
- Scroll compressor
- Stainless steel heat exchanger
- Circulation pumps for brine and heating systems
- Valves and safety equipment for cooling systems
  and corresponding electrical components.

2 **Water heater**
- 180 litres
- Internal anti-corrosion protection with copper or stainless steel
- It has an anode that does not require replacing, which means that it is maintenance-free
- Defrosting tank containing heated brine for defrosting the outdoor unit

3 **Outdoor unit**
- Heat exchanger
- Fan

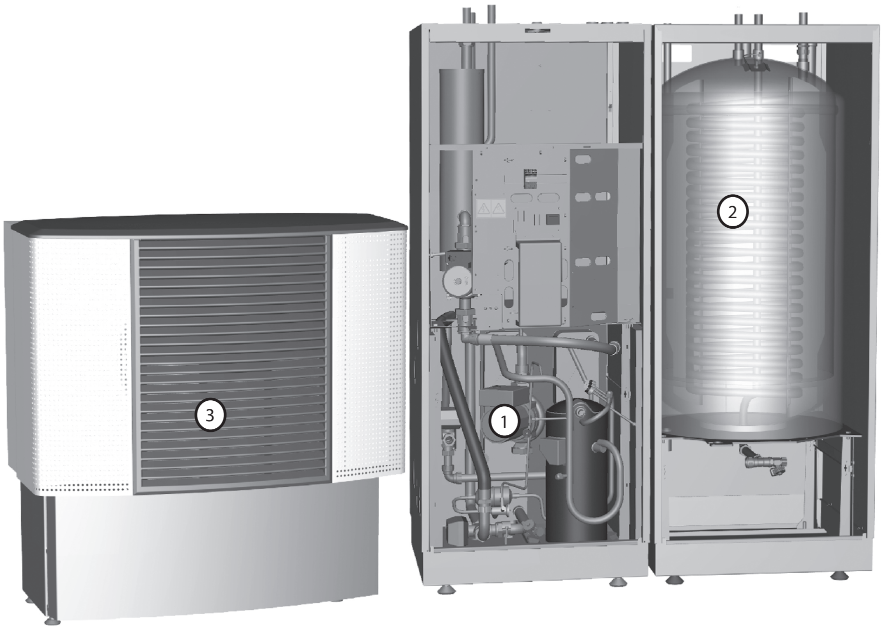


Figure 80: DHP-AL components.

12.4 Passive cooling function, DHP-C

Heat pump DHP-C is equipped with an extra heat exchanger to use the passive cooling effect from the brine. Because the temperature in the collector (borehole or equivalent) is lower than the indoor temperature, the temperature difference can be exploited to cool the indoor air. At the same time the collector is charged with energy before the cold periods of the year.

DHP-C is a complete installation for heating, hot water and passive cooling where the control automatically ensures that the desired indoor climate is reached. Because the DHP-C uses the same pipe system for heating and cooling, it is important to use a temperature when cooling that does not cause condensation on the pipe system. (If the system is not adapted to it.) Use of fan convectors is recommended.

12.5 Speed control, Opti models

A heat pump requires optimum conditions in the heating system and brine circuit in order to be able to run as efficiently as possible. The temperature difference between the heating system's supply line and return line must be constant between 7–10°C. For the brine circuit a temperature difference of 3°C between supply and return line applies. If the differences are greater or less, the heat pump is less efficient and savings are lower.

A heat pump with speed controlled circulation pumps always ensures that they retain the temperature differences. The control equipment detects if the balance is in jeopardy and increases or decreases the speed of the circulation pumps as necessary.

12.6 HGW technology, DHP-H Opti Pro

The HGW technique is a new and unique method for hot water heating, which is used in DHP-H Opti Pro. At the same time as the water is heated to be distributed around the house heating system, a small proportion flows via an extra de-superheater, which heats the water before it enters the water heater. The exchange valve that controls the flow between hot water and heating system is replaced with a shunt (HGW shunt).

During heating production, the HGW shunt ensures that a flow over the de-superheater to the water heater. The flow through the shunt is continuously regulated by the heat pump control by sending opening or closing pulses to the shunt.

12.7 Auxiliary heating, DHP-H, -L, -C

If the heat demand is greater than the heat pump's capacity, the auxiliary heater engages automatically. The auxiliary heater is made up of an electric heating element on the supply line that has two outputs, AUX. HEAT 1 and AUX. HEAT 2, and can be controlled in three steps.

For three phase, 400V 3N, installations:

- Step 1 = AUX. HEAT 1 = 3 kW
- Step 2 = AUX. HEAT 2 = 6 kW
- Step 3 = AUX. HEAT 1 + AUX. HEAT 2 = 9 kW

For single phase, 230V 1N, installations (not DHP-C):

- Step 1 = AUX. HEAT 1 = 1,5 kW
- Step 2 = AUX. HEAT 2 = 3 kW
- Step 3 = AUX. HEAT 1 + AUX. HEAT 2 = 4.5 kW

In the event of an alarm, the auxiliary heater engages automatically.

12.8 Auxiliary heating DHP-A, -AL

The auxiliary heater for 400V 3N heat pumps is made up of an electric heating element on the supply line that has three outputs, AUX. HEAT 1, AUX. HEAT 2 and AUX. HEAT 3, and can be controlled in five steps:

- Step 1 = AUX. HEAT 1 = 3 kW
- Step 2 = AUX. HEAT 2 = 6 kW
- Step 3 = AUX. HEAT 1 + AUX. HEAT 2 = 9 kW
- Step 4 = ADD.HEAT 2 + ADD.HEAT 3 = 12 kW (only connected at switched off compressor)
- Step 5 = ADD.HEAT 1 + ADD.HEAT 2 + ADD.HEAT 3 = 15 kW (only connected at switched off compressor)
- Step +4 = ADD.HEAT 2 + ADD.HEAT 3 = 12 kW (compressor operation permitted)
- Step +5 = ADD.HEAT 1 + ADD.HEAT 2 + ADD.HEAT 3 = 15 kW (compressor operation permitted)

The two power steps, step 4 and step 5, cannot be activated when the compressor is running. There are further auxiliary heating steps: step +4 and step +5, which means that these additional steps can be activated whilst the compressor is running. Step +4 and +5 must only be selected on the condition that the building where the heat pump is installed has a large heating demand and the building's electric installation is suitable for high current consumption.

The auxiliary heater for 230V 1N heat pumps is made up of an electric heating element on the supply line that has two outputs, AUX. HEAT 1 and AUX. HEAT 2, and can be controlled in three steps:

- Step 1 = AUX. HEAT 1 = 1,5 kW
- Step 2 = AUX. HEAT 2 = 3 kW
- Step 3 = AUX. HEAT 1 + AUX. HEAT 2 = 4.5 kW

In the event of an alarm, the auxiliary heater engages automatically.

12.9 Water heater, DHP-H, -C

Danfoss heat pumps DHP-H, -C, are supplied with an integrated 180 litre water heater.

Position	Name
1	Hot water line
2	Temperature sensors
3	Water heater
4	TWS coil
5	Start temperature sensor
6	Return from TWS coil
7	Filler pipe
8	Flow line to TWS coil

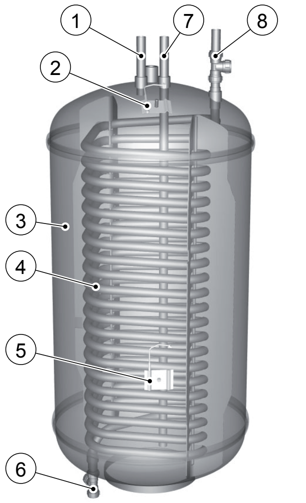


Figure 81: Water heater in DHP-H and DHP-C.

Hot water production is prioritised ahead of heat production, i.e. no heat is produced when there is a hot water demand at the same time.

The temperature of the hot water cannot be adjusted. Normally, hot water production does not cease at a determined temperature but when the compressor's operating pressure switch reaches its maximum operating pressure, which corresponds to a hot water temperature of approximately 50-55°C.

Using a regular time interval, the water in the water heater is given extra heat by the integrated auxiliary heater to prevent the build up of bacteria (anti-legionella function). The factory set time interval is seven days (can be adjusted). When the anti-legionella function is active the heat pump produces hot water until the temperature for the start temperature sensor (5) has reached 60°. If the heat pump cannot raise the temperature sufficiently within 3.5 hours the control checks if there is any heating requirement, before the anti-legionella function tries again.

In the control computer's TEMPERATURE menu, a number of measured and calculated temperatures for the hot water and supply are displayed. The current hot water temperature (2) and the temperature of the supply line during heating and hot water production is displayed. The temperature of the supply line often exceeds the maximum permitted hot water temperature, but usually during hot water production.

12.10 Water heater, DHP-A, -AL

The hot water heaters for DHP-A,-AL differ from the other heat pumps in that the function for defrosting of the outdoor unit is different. The 180 litre hot water heater has a defrosting tank (mantle) on the outside of the heater that contains heated brine (approx 47 litres) which is used during defrosting.

The difference between a DHP-A, -AL is only that the water heater is integrated in DHP-A and is a separate unit for DHP-AL.

Position	Name
1	Tap hot water
2	Temperature sensors
3	Defrosting tank
4	Water heater
5	TWS coil
6	Filler pipe
7	Flow line to TWS coil
8	Expansion outlet when outdoor unit is positioned at high level

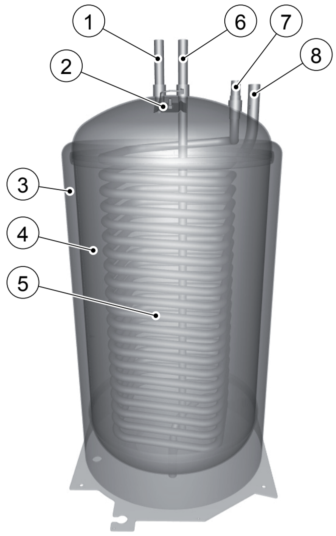


Figure 82: Water heater for DHP-A and DHP-AL.

12.11 Important parameters

Heat production - calculating

The indoor temperature is adjusted by changing the heat pump's heat curve, which is the control computer's tool for calculating what the supply temperature should be for water that is sent out in the heating system. The heat curve calculates the supply temperature depending on the outdoor temperature. The lower the outdoor temperature, the higher the supply temperature. In other words, the supply temperature of the water fed to the heating system will increase exponentially as the outside air temperature falls.

The heat curve will be adjusted in connection with installation. It must be adapted later on, however, to obtain a pleasant indoor temperature in any weather conditions. A correctly set heat curve reduces maintenance and saves energy.

CURVE

The control computer shows the value for CURVE by means of a graph in the display. You can set the heat curve by adjusting the CURVE value. The CURVE value indicates the supply temperature of the water to be sent out to the heating system at an outdoor temperature of 0°C.

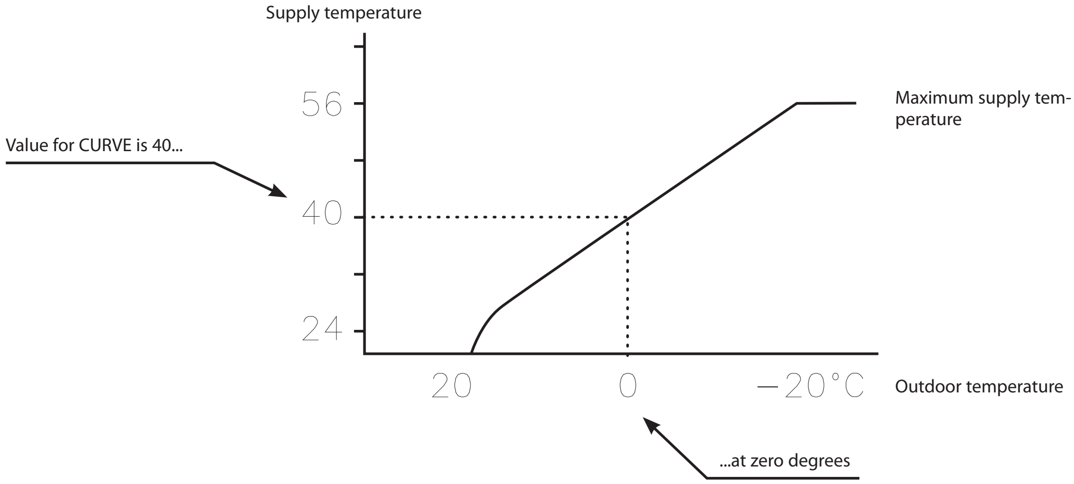


Figure 83: Graph showing the set value 40 for CURVE.

At outdoor temperatures colder than 0°C, supply water hotter than 40°C is sent out to the heating system and at outdoor temperatures greater than 0°C, supply water cooler than 40°C is sent out.

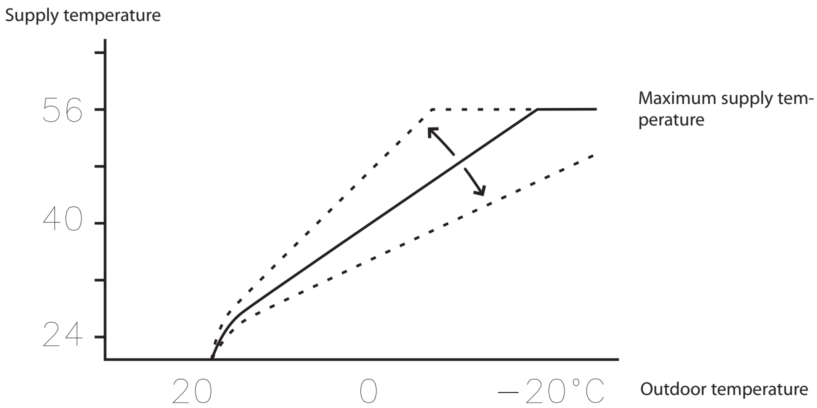


Figure 84: Increasing or reducing the CURVE changes the slope of the curve

If you increase the CURVE value, the heat curve will become steeper and when you reduce it, it will become flatter.

The most energy efficient and cost effective setting is achieved by changing the CURVE value to adjust the temperature in the house to an even and constant temperature. For a temporary increase or reduction, adjust the ROOM value instead.

ROOM

If you wish to increase or reduce the indoor temperature, change the ROOM value. The difference between changing the ROOM value and the CURVE value is that the system's heat curve does not become steeper or flatter if the ROOM value is changed, which the curve becomes if the CURVE value changes, instead the entire heat curve is moved by 3°C for every degree change of the ROOM value. The reason that the curve is adjusted 3° is that an approximate 3° increase in supply temperature is needed to increase the indoor temperature 1°.

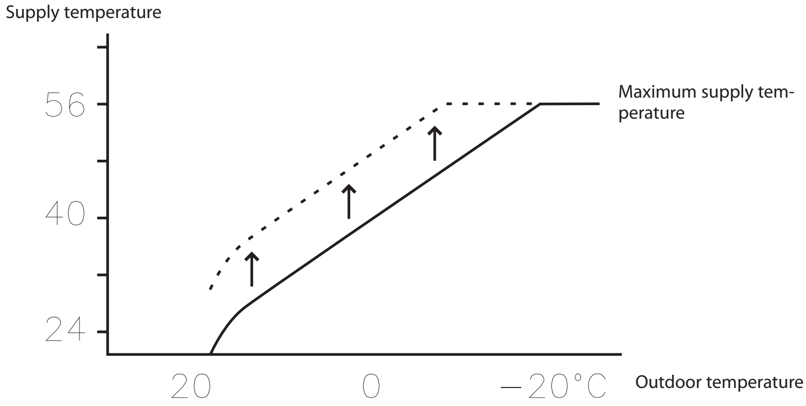


Figure 85: Changing the ROOM value changes the heat curve upwards or downwards.

The relationship of the supply temperature to outdoor temperature will not be affected. The supply temperature will be increased or reduced by the same number of degrees all along the heat curve. I.E. the entire heat curve rises or drops instead of the curve gradient changing.

This method of adjusting the indoor temperatures can be used for a temporary raise or drop. For long term increases or reductions of the indoor temperature, the heat curve is adjusted instead.

Sometimes, at outdoor temperatures between -5°C and +5°C, part of the heat curve may need adjusting if the indoor temperature is not constant. For this reason, the control system includes a function adjusting the curve at three outdoor temperatures: -5°C, 0°C and +5°C. This function will allow you to increase or reduce the supply temperature, without affecting the heat curve, at three specific outdoor temperatures. If, for example, the outdoor temperature is -5°C, the supply temperature will change gradually between 0°C and -10°C, maximum adjustment being reached at -5°C. The figure below displays the adjusted CURVE -5. The adjustment can be seen on the graph in the form of a bump.

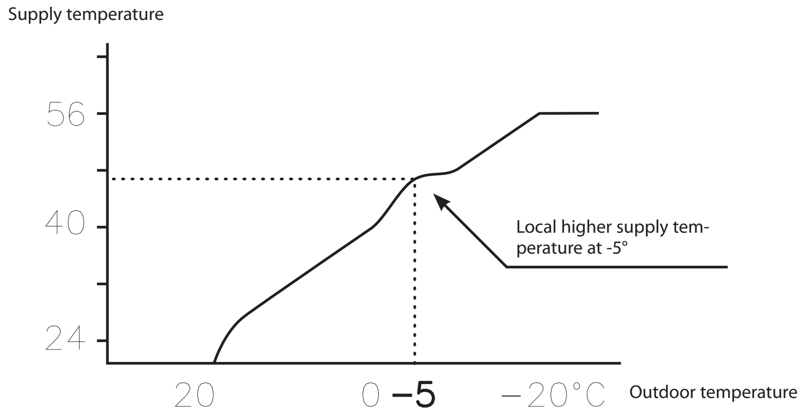


Figure 86: The adjusted curve at -5°C

You can choose to adjust the heat curve individually at three specified outdoor temperatures: -5°C, 0°C and +5°C. The supply temperature can be changed by plus/minus 5 degrees.

HEATSTOP

The HEATSTOP function automatically stops all production of radiator heat when the outdoor temperature is equal to, or higher than, the value entered for heat-stop.

When the heat-stop function is activated, the circulation pump will be turned off - except when hot water is being produced. The circulation pump will be "exercised" for 1 minute per day. The factory set value for activating heat-stop is an outdoor temperature of 17°C. If the heat-stop function is active, the outdoor temperature must drop 3°C when setting, before the heat-stop stops.

MIN and MAX

The MIN and MAX values are the lowest, respectively highest set point values that are allowed for the supply temperature.

Adjusting the minimum and maximum supply temperatures is particularly important if your home has under floor heating.

If your house has under floor heating and parquet floors, the supply temperature must not exceed 45°C. Otherwise there is a risk that the parquet floors might be damaged. If you have under floor heating and stone tiles, the MIN value should be 22-25°C, even in summer when no heating is required. This is to achieve a comfortable floor temperature.

If your house has a basement, the MIN value should be adjusted to a suitable temperature for the basement in summer. A condition for maintaining the heat in the basement in the summer is that all radiators have thermostat valves that switch off the heat in the rest of the house. It is extremely important that the heating system and the radiator valves are trimmed correctly. As it is usually the end customers themselves who have to carry out trimming, remember to inform them how to carry it out correctly. Also remember that the value for HEATSTOP needs adjusting upwards for summer heating.

TEMPERATURES

The heat pump can display a graph showing the history of the various sensors' temperatures and you can see how they have changed over 60 measurement points in time. The time interval between the measurement points can be adjusted between one minute and one hour, factory setting is one minute.

History is available for all sensors, but only the set value is shown in the display for the room sensor. The integral value that may appear is the heating system's energy balance.

INTEGRAL

The heat demand in the house depends on the season and weather conditions and is not constant. The heat demand can be expressed as temperature difference over time and can be calculated giving an integral value as a result (heat demand). To calculate the integral value, the control computer uses several parameters.

A heat deficit is needed to start the heat pump, and there are two integral values, A1 and A2, which start the compressor and auxiliary heater. During heat production, the deficit reduces and when the heat pump stops, the inertia in the system causes a surplus of heat.

The integral value is a measurement of the surface under the time axis and is expressed in degree minutes. The figure below shows the factory settings for the integral values that the heat pump has. When the integral value has reached the set value for INTEGRAL A1, the compressor starts and if the integral value does not drop but continues to rise, the auxiliary heater starts when the integral value has reached the set value for INTEGRAL A2.

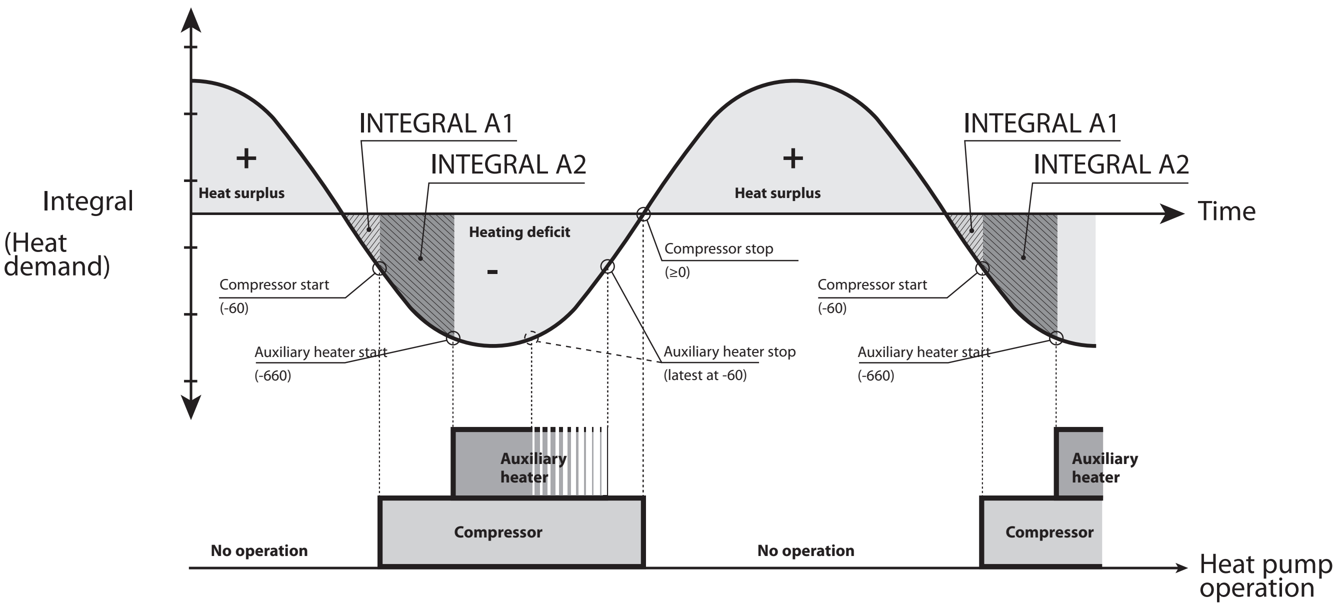


Figure 87: Starting and stopping heat pump operation based on integral values.

The integral value calculation stops during hot water production and during heatstop. Integral value calculation resumes two minutes after completed hot water production to give the heating system time to stabilise the temperature.

More specific conditions for starting and stopping the heat pump are described in the "Operating conditions" chapter.

HYSTERESIS

In order to start the heat pump in advance during sudden changes of the heat demand, there is a value, HYSTERESIS, which controls the difference between the actual supply temperature, t_1 and the calculated supply temperature, t_2. If the difference is the same or greater than the set HYSTERESIS value (x), i.e. there is a heat demand, or the heat demand disappears, quicker than the usual integral calculation, the integral value is forced to either the start value INTEGRAL A1 or to the stop value 0°min.

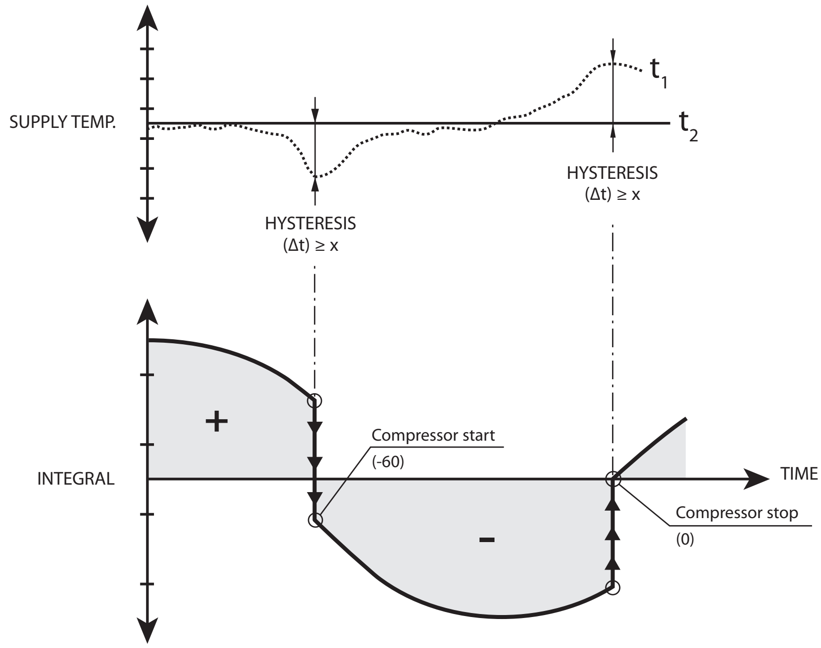


Figure 88: Conditions for HYSTERESIS to force the integral value to change.

DEFR CURVE, defrosting curve for DHP-A, -AL

To start defrosting the outdoor unit for DHP-A, -AL, the control computer makes a calculation using the temperature of the brine return and the outdoor temperature.

What guides the calculation is a linear defrosting curve that can be set so that the heat pump and outdoor unit work optimally. The setting of three different values can be changed: DEFR CURVE 0, DEFR CURVE –20 and OUTDOOR STOP. The defrosting sequence starts when the temperature of the brine return reaches the set parameter value at an outdoor temperature somewhere along the set defrosting curve.

The two parameters that are mainly changed are DEFR CURVE 0 and DEFR CURVE -20. The numbers behind the DEFR CURVE display what outdoor temperature the setting is for, that is to say at 0°C for DEFR CURVE 0 and -20 for DEFR CURVE -20. The value -20 for DEFR CURVE -20 is the set value for OUTDOOR STOP, so if the value for OUTDOOR STOP changes, the numbers behind DEFR CURVE also change.

Factory setting for OUTDOOR STOP is -20°C. At this outdoor temperature, compressor operation is stopped and the addition takes over. It is seldom that the value of OUTDOOR STOP needs to be changed, tests and operating cases have shown that -20°C operates very well as the stop temperature. In the text and figures below the value -20°C has been used for OUTDOOR STOP.

The control computer shows the value for DEFR CURVE 0 and DEFR CURVE –20 by means of a graph in the display.

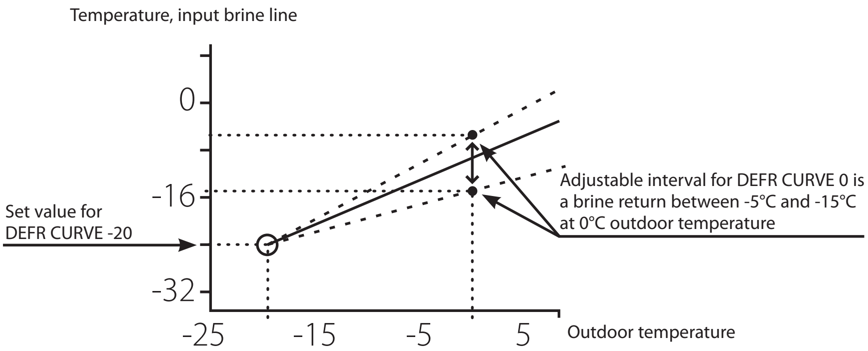


Figure 89: Graph that shows how the value for DEFR CURVE 0 can be set.

The value for OUTDOOR STOP that is set means that the compressor will no longer be used for heating or hot water production if the outdoor temperature is the same as or lower than the value. Heating and hot water production then occurs with the help of the auxiliary heater.

The value for DEFR CURVE 0 is the temperature that the brine return is permitted to reach when a defrost must start at outdoor temperature 0°C.

In the corresponding way the value for DEFR CURVE -20 is the temperature that the brine return has when a defrost should start at the set outdoor temperature for OUTDOOR STOP. The setting for DEFR CURVE –20 means that the value OUTDOOR STOP (-20°C) is reduced by between 1 and 8 degrees. This also determines how much lower the temperature for the brine return may be than -20°C in this case.

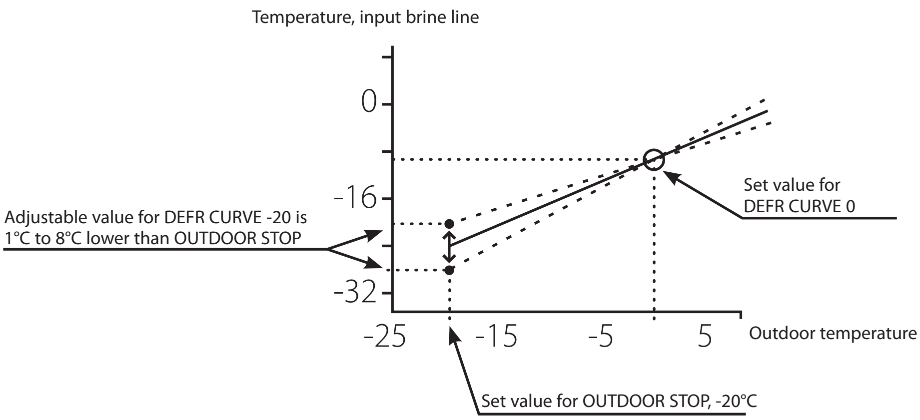


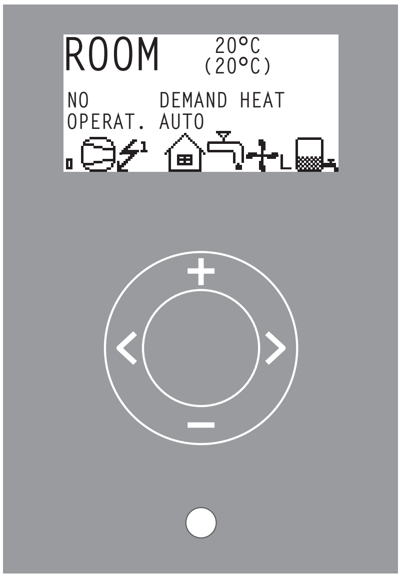
Figure 90: Graph that shows how the value for DEFR CURVE -20 can be set.

These three settings together create the defrosting curve and all three values have an effect on when defrosting will start, even if it is mainly DEFR CURVE 0 and DEFR CURVE -20 that is changed.

13 Control computer

13.1 Function description

A control computer is used to automatically calculate the heat demand in the house where the heat pump is installed and to ensure that the correct amount of heat is produced and emitted where necessary. There are many different values (parameters) that must be referred to during the calculation of the heat demand. During installation use the control computer to set and change certain values that have to be adapted according to the house demand. The control computer is also used during service to view alarms and history, and to check the value settings. The display window, keypad and an indicator are on the front of the control computer. It consists of a simple menu system that is used to navigate the desired settings and values.



The symbols in the display are only examples. Certain symbols cannot be displayed at the same time.

Figure 91: Display, control buttons and indicator for the heat pump.

Use the four control buttons on the keypad to navigate the menus and increase or reduce the set values:

- An up button with a plus sign +
- A down button with a minus sign –
- A right button with a right arrow >
- A left button with a left arrow <

The display always shows the set ROOM value and the status of the heat pump.

There are two main menus that are used to affect the heat pump settings. The menus are designed for two categories of user, end customers and installers, who make different settings in the control computer. For this reason the service menu is hidden from end customers.

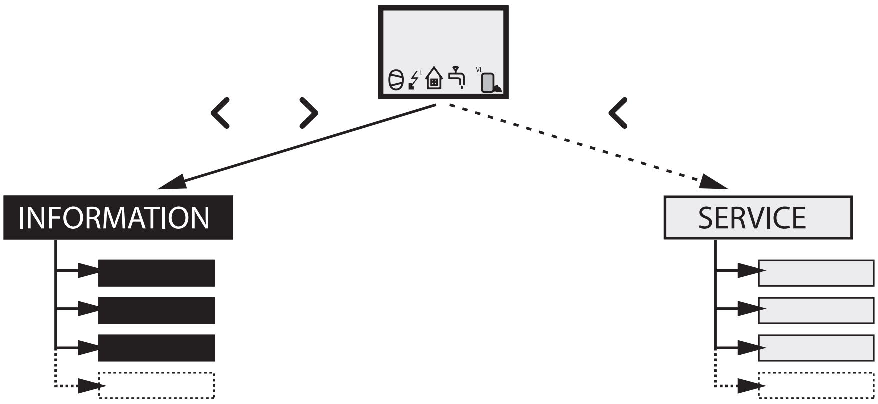


Figure 92: The menus are reached via different button presses.

The main menu, INFORMATION, is opened by pressing the left or right buttons. From the INFORMATION menu you can open the sub menus to make settings for the heat pump.

For installation or service, the hidden main menu, SERVICE, is used. This is opened by holding the left button depressed for five seconds. From the service menu you can open sub menus to make advanced settings.

13.2 Display

The display of the control computer shows information about the heat pump's operation, status and any alarms, in text form. The status, indicated by symbols, is also shown in the lower section which shows the heat pump's active process.

Operating mode

Appears with applicable heat pump operating status text.

Operating mode	Meaning
(OFF)	The installation is fully switched off. **Remember that if the operating mode OFF is to be used for long periods during the winter, the water in the heating system in the installation must be drained, otherwise there is a risk of frost damage.**
AUTO	The heat pump and the auxiliary heater are automatically controlled by the control computer.
HEATPUMP	The control computer is controlled so that only the heat pump unit (compressor) is allowed to operate. In this operating mode peak heating charging (legionella function) of the hot water will not be run because additional heat must not be used.
ADD. HEAT	The control computer only permits the auxiliary heater to be in operation. This operating mode can be used when a new installation is being used, when the brine system is not ready for operation.
HOT WATER	In this mode the heat pump only produces hot water, no heat goes to the heating system.

Symbols

Displays the operating status of the heat pump using symbols.

Symbol		Meaning
	HP	Indicates that the compressor is in operation.
	LIGHTNING	Indicates that the auxiliary heater is in operation. Number of auxiliary power stages indicated by digit.
	HOUSE	Indicates that the 3-way valve position is for heat production for the house.
	TAP	Indicates that the 3-way valve's position is for hot water production.
F	FLOW GUARD	An "F" next to the symbol indicates that a flow guard is installed.
	CLOCK	Indicates that tariff control is active.
	TANK	Indicates the level of hot water in the water heater. During charging, the tank is filled and filling starts at the set start temperature. A lightning symbol by the symbol indicates peak heating charging (legionella function).
	SQUARE	Either indicates that the operating pressure switch has deployed, or that the hot gas temperature has reached its maximum temperature.
	DEFROST	Displayed if defrosting is active. (DHP-A, -AL)
	FAN	Displayed if the fan is active L=Low speed and H= High speed. (DHP-A, -AL)
	COOLING	Indicates Cooling. A indicates active cooling.

Text

Appears with applicable heat pump operating status text.

Message	Meaning
ROOM	Shows the set ROOM value. Standard value: 20°C. If the accessory room sensor is installed it shows the actual temperature and the desired indoor temperature within brackets.
ERR PHASE SEQ.	Alarm that indicates that there is an incorrect phase sequence to the compressor. Only display and only the first 10 minutes.
HIGH RETURN	Alarm that indicates that the high return temperature prevents the compressor's operation.

Message	Meaning
START	Indicates that there is a demand for heating production and that no start delay is active.
EVU STOP	Indicates that the additional function EVU is active. This means that the heat pump is off as long as EVU is active.
NO DEMAND HEAT	Indicates that there is no heating production demand.
HIGHPRESS ERROR	Alarm that indicates that the high pressure switch has deployed.
LOWPRESS ERROR	Alarm that indicates that the low pressure switch has deployed.
MOTOR P ERROR	Alarm that indicates that the motor protection has deployed.
BRINEFLOW LOW	Appears if the accessory flow switch is installed. Alarm that indicates that the flow in the brine system is low.
SENSOR	Alarm that indicates a faulty sensor.
HEATPUMP START --MIN	Indicates that there is a heating production demand and will start in the specified number of minutes.
HEATPUMP+ADD.HEAT	Indicates that heat production is active with both compressor and auxiliary heater.
START_MIN	Indicates that there is a demand for heating production but that a start delay is active.
ADD. HEAT	Indicates that there is an auxiliary heater demand.
COOLING	Displayed if cooling is passive.
COOLING A	Displayed if cooling is active.
DEFROST	Displayed if defrosting is active. (DHP-A, -AL)

14 Menus

14.1 Main menu INFORMATION

This menu is used to change the heat pump's operating modes and adjust the heat curve. History and operating times can also be viewed here. Open the menu by pressing the left or right button. The sub menus available in the INFORMATION menu are shown in the following table:

Main menu	Sub menu	Selection/settings
INFORMATION		
	OPERATION	
		Ø AUTO HEATPUMP ADD. HEAT HOT WATER *MANUAL TEST*
	HEATCURVE	
		CURVE MIN MAX CURVE +5 CURVE 0 CURVE -5 HEATSTOP REDUCTION ROOM FACTOR *POOL* *POOL HYSTERESIS*
	HEAT CURVE 2 (Expansion card)	
		CURVE 2 *MIN* *MAX*
	TEMPERATURE	
		OUTDOOR ROOM Supply line Return line HOT WATER INTEGRAL BRINE OUT BRINE IN *POOL* *SHUNTGROUP* *COOLING* *CURRENT*
	OPERAT.TIME	
		HEATPUMP ADD. HEAT 1 ADD. HEAT 2 *ADD. HEAT 3* HOT WATER *COOLING* *COOLING A*
	DEFROST (Defrost card)	
		DEFROSTS *BETW. 2 DEFR* *TIME SINCE DEFROST* *FAN H OFF AT* *DEFROST CURVE* *MANUEL DEFR*

Menus in italics are only visible if the expansion card or defrosting card (DHP-A, -AL) is installed.

Sub menu INFORMATION -> OPERATION

Used to select operating mode.

Menu selection	Meaning	Factory setting
⏻ (OFF)	The installation is off. Any active alarms reset.	-
AUTO	Automatic operation with both heat pump and auxiliary heater permitted. If the number of power stages for auxiliary heating are set to zero (SERVICE -> AUX. HEAT -> MAX STAGE) only AUTO or OFF can be selected as operating mode.	-
HEATPUMP	Operation with only heat pump permitted. NOTE! No peak heating charging (legionella function) with only heat pump operation.	-
ADD. HEAT	Operation with only auxiliary heater permitted.	-
HOT WATER	Operation with heat pump for hot water production and auxiliary heater during peak heating charging (legionella function).	-
MANUAL TEST	Only appears when MANUAL TEST in the SERVICE menu is active. Outputs controlled manually.	-

Sub menu INFORMATION -> HEAT CURVE

Used to change settings for the heat curve.

Menu selection	Meaning	Factory setting
CURVE	Calculated supply temperature at 0°C outdoor temperature. Shown as a graph that also shows MIN and MAX values.	40°C (during under floor heating 30°C) (interval: 22°C / 56°C)
MIN	Minimum permitted supply temperature, if the temperature for heat-stop has been reached and the heat pump has stopped.	10°C (interval: 10°C / 50°C)
MAX	Maximum permitted supply temperature.	55°C (during under floor heating 45°C) (interval: 40°C / 85°C)
CURVE 5	Local increase or reduction of CURVE at an outdoor temperature of +5°C. Shown in the graph for CURVE.	0°C (interval: -5°C / 5°C)
CURVE 0	Local increase or reduction of CURVE at an outdoor temperature of 0°C. Shown in the graph for CURVE.	0°C (interval: -5°C / 5°C)
CURVE -5	Local increase or reduction of CURVE at an outdoor temperature of -5°C. Shown in the graph for CURVE.	0°C (interval: -5°C / 5°C)
HEATSTOP	Maximum outdoor temperature when heat production is permitted. If HEAT STOP applies, the outdoor temperature must drop 3°C below the setting before HEAT STOP stops.	17°C (interval: ⏻, 0°C / 40°C)
REDUCTION	Only appears if the tariff control function has been activated. Lowering set room temperature. Active at 10 kohm connection at EVU input.	2°C (interval: 1°C / 10°C)
ROOM FACTOR	Only displayed if an accessory Room temperature sensor is installed. Determines how large an impact the room temperature is to have when calculating the supply temperature. For underfloor heating we recommend a setting between 1-3 and for radiator heating between 2-4.	2 (interval: 0 / 4) (0 = no impact, 4 = large impact)
POOL (Expansion card)	Only appears if POOL is selected. The temperature in the pool is controlled by a separate sensor regardless of the heating and hot water system.	20°C (interval: ⏻, 5°C / 40°C)
POOL HYSTERESIS (Expansion card)	Only appears if POOL is selected. In simple terms, the POOL HYSTERESIS is the temperature interval between start and stop for pool heating. If the difference between the actual supply temperature to pool and the calculated supply temperature is too great, either the integral value is set to start value A1 (the heat pump starts) or the value is set to 0 (stops the heat pump).	2°C (interval: 1°C / 10°C)

Sub menu INFORMATION -> HEAT CURVE 2

The menu is active if the expansion card is installed and only appears if shunt group sensor is connected and activated in menu SERVICE -> INSTALLATION -> SYSTEM -> SHUNTGROUP (Expansion card). Used to change settings for heat curve 2.

Menu selection	Meaning	Factory setting
CURVE 2	Calculated shunt group temperature at 0°C outdoor temperature. Shown as a graph that also shows MIN and MAX values.	40°C (interval: 22°C / 56°C)
MIN	Minimum permitted shunt group temperature, if the temperature for heat-stop has not been reached.	10°C (interval: 10°C / 50°C)
MAX	Maximum permitted shunt group temperature.	55°C (interval: 15°C / 70°C)

Sub menu INFORMATION -> TEMPERATURE

Used to indicate the prevailing temperatures, history and set/calculated values. History can be accessed to view all the values by pressing the right arrow to present a graph of the last 100 measurement points for the set time interval (SERVICE -> INSTALLATION -> LOGTIME). In the event of an alarm, history stops being logged until the alarm is reset by changing the operating mode to OFF.

Menu selection	Meaning	Factory setting
OUTDOOR	Shows the actual outdoor temperature.	-
ROOM	Shows the actual set temperature.	-
Supply line	Shows the actual supply temperature. The calculated supply temperature to the heating system group is within brackets. During hot water production in operating mode ADD.HEAT the value for HOT WATER STOPP + 5° is shown within brackets.	-
Return line	Shows the actual return temperature. The stop temperature, MAX RETURN is within brackets.	-
HOT WATER	Shows the actual hot water temperature.	-
INTEGRAL	Shows the actual calculated value for integral.	-
BRINE OUT	Shows the actual temperature for brine out.	-
BRINE IN	Shows the actual temperature for brine in.	-
POOL (Expansion card)	Only appears if POOL is selected. Shows the actual pool temperature. The set pool temperature is shown in brackets.	-
SHUNTGROUP (Expansion card)	Only appears if SHUNTGROUP is selected. Shows the actual supply temperature. The calculated supply temperature to the shunt group is within brackets.	-
COOLING (Expansion card)	Only appears if COOLING is selected. Shows the actual supply temperature. The set point value is shown in brackets.	-
CURRENT (Expansion card)	Only appears if CURRENT LIMITER is selected. Shows the actual current consumption. The set value for MAX CURRENT is shown between brackets.	-

Sub menu INFORMATION -> OPERAT. TIME

Used to show the operating time for each component. Time given in hours.

Menu selection	Meaning	Factory setting
HEATPUMP	Compressor operating time for both heating and hot water production.	-
ADD. HEAT 1	Operating time auxiliary heater power stage 1 with full output 3 kW (VL).	-
ADD. HEAT 2	Operating time auxiliary heater power stage 2 with full output 6 kW (VL).	-
ADD.HEAT 3 (Defrost card)	Operating time auxiliary heater power stage 3 with full output 6 kW (VL).	-
HOT WATER	Operating time hot water with compressor.	-
COOLING (Expansion card)	Operating time passive cooling.	-
COOLING ACTIVE (Expansion card)	Operating time active cooling.	-

Sub menu INFORMATION -> DEFROST (*DHP-A, -AL*)

The menu applies to DHP-A, -AL with defroster card and only appears if OUTDOOR AIR in the SERVICE -> INSTALLATION -> SYSTEM -> HEAT SOURCE menu is selected. Used to obtain information about outdoor unit defrosting and to make certain settings.

Menu selection	Meaning	Factory setting
DEFROSTS	Total number of defrosts carried out.	-
BETW. 2 DEFR	The operating time of the compressor in minutes between the 2 last defrosts.	-
TIME SINCE DEFROST	The operating time of the compressor in minutes since last defrost.	-
FAN H OFF AT	Fan high speed is deactivated at this temperature and low speed is activated.	12°C (interval: 10°C / 20°C)
DEFROST CURVE	Here, the angle of the defrost curve can be changed using the right-hand arrow and by either pressing + or – (Change the start temperature for defrost).	-10°C (interval: -13°C / -7°C)
MANUEL DEFR	By using the right-hand arrow + or -, defrost can be started manually (shunts +20°C for 10 minutes).	0 (interval: 0 / 1)

14.2 Main menu SERVICE

This menu is for use during installation and service to optimise and adjust the operation of the heat pump. Access the menu by holding the left arrow in for five seconds. The sub menus available in the SERVICE menu are shown in the following table:

Menu	Sub menu	Selection/ settings	
SERVICE			
	HOT WATER		
		START HOT WATER TIME HEATING TIME TOPH. INTERVAL TOPH. STOP INFL. START SEN. WEIGHT HOT WATER	
	HEAT PUMP		
		INTEGRAL A1 HYSTERESIS MAX RETURN START INTERVAL ALARM BRINE PRESS. PIPE OUTDOOR STOP SHUNT COOLING	
	AUX. HEATER		
		INTEGRAL A2 HYSTERESIS MAX STEP MAX CURRENT SHUNT TIME HOT WATER STOP	
	MANUAL TEST		
		MANUAL TEST HEAT PUMP BRINE PUMP CIRC. PUMP REV.V. HOT WATER SHUNT 1 AUX. HEAT 1 AUX. HEAT 2 AUX. HEAT 3 SHUNT DEFR FAN L FAN H EXT. AUX. HEATER ALARM SHUNT COOLING SHUNT GROUP HGW-SHUNT PASSIVE COOLING ACT COOLING REV. V. POOL	
	INSTALLATION		
		ENGLISH	
		SYSTEM	
			HEAT SOURCE HEATING SYSTEM COOLING POOL SHUNT GROUP ADDITION
		SERVICE TIME FACTORY SET RESET OPER. TIME SENSOR CALIBRATION VERSION LOG TIME BRINE TIME ON BRINE TIME OFF TOPH. TIME TOPH. TIME D	

SERVICE CONT'D.	DEFROST		
		DEFR CURVE 0 DEFR CURVE -XX DEFR TEMPERATURE STOP DEFR UNDER 5°C DEFR MIN TIME DEFROST DEFROST SENSOR	
	OPTIMUM		
		TEMP DIFF CIRC. TEMP DIFF BRINE START FLOW CIRC. START FLOW BRINE CONST.FL.CIRC CONST.FL.BRINE MIN FLOW CIRC. MAX HW MIN HW	
	HGW		
		HGW TEMP TEMP DIFF HOT WATER DIFF HOT WATER TO RAD MAX TEMP START HGW INITIALIZING HGW INTEGRAL DELAY HGW-SHUNT TIME HGW INT. BOUND. HGW INTEGRAL PULSE WIDTH PULSES	

Sub menu SERVICE -> HOT WATER

Used to change the settings for hot water production.

Menu selection	Meaning	Factory setting
START	Start temperature for hot water production. Shows the actual hot water temperature and the value within brackets indicates the start temperature. (⏻ = no sensor alarm)	40°C (interval: ⏻, 30°C / 55°C)
HOT WATER TIME	Time for hot water production during combined hot water and heating demand, in minutes.	40M (up to 8kW) 20M (10kW and more) (interval: 5M / 40M)
HEATING TIME	Time for hot water production during combined heating and hot water demand, in minutes.	20M (interval: 5M / 40M)
TOPH. INTERVAL	Time interval between peak heating charging, legionella function, in days.	7D (interval: ⏻, 1D / 90D)
TOPH. STOP	Stop temperature for peak heating charging (applies to VL system).	60°C (interval: 50°C / 65°C)
INFL. H.W SENSOR	Water heater sensor's influence compared with the peak sensor's at start of water heating.	65% (interval: 0% / 100%)
WEIGHT HOT WATER	The calculated value of the hot water sensor directed towards the peak sensor.	-

Sub menu SERVICE -> HEATPUMP

Used to change the heat pump's operating settings.

Menu selection	Meaning	Factory setting
INTEGRAL A1	The integral's value for starting the heat pump. See section 12.9 for further information.	60 (interval: 5 / 250)
HYSTERESIS	If the difference between the actual supply temperature and the calculated supply temperature is too great either the integral value is set to start value A1 (the heat pump starts) or the value is set to 0 (stops the heat pump). See section 12.9 for further information.	10°C (at OUTSIDE AIR temperature of 12°C) (interval: 1°C / 15°C)
MAX RETURN	Stop temperature at high return from the heating system.	55°C (interval: 30°C / 70°C)
STARTINTERVAL	Minimum tine interval between two heat pump starts in minutes.	20M (interval: 10M / 30M)
ALARM BRINE	Not shown if OUTSIDE AIR is selected as heat source. Alarm temperature for supply brine (brine out), which stops the heat pump. (⏻ = no sensor alarm)	⏻ (interval: ⏻, -14°C / 10°C)
PRESSURE PIPE	Sensor on the compressor's hot gas line. Value within brackets indicates maximum permitted temperature. If this value is exceeded, the compressor will stop and start again as soon as the temperature has dropped. No alarm shown in the display, however, a square is shown in the left, lower corner of the display.	130°C (interval: 100°C / 160°C)
OUTDOOR STOP	Only appears if OUTSIDE AIR is selected. Lowest outdoor temperature when the outdoor sensor stops the compressor and heating or hot water is instead produced with the auxiliary heater.	-20°C (interval: -20°C / -1°C)
SHUNT COOLING (Expansion card)	Set point value for cooling. Desired temperature for supply line.	18°C (interval: 0°C / 30°C)

Sub menu SERVICE -> ADD. HEAT

Used to change the heat pump stage's operating settings.

Menu selection	Meaning	Factory setting
INTEGRAL A2	Two conditions must be fulfilled in order to start the auxiliary heater: the integral's value to start must be less than integral A1 + A2, and the supply temperature must be 2° lower than the calculated temperature.	600 (interval: 50 / 990)
HYSTERESIS	If the difference between the actual supply temperature and the calculated supply temperature is too great either the integral value is set to start value A1 + A2 (the addition starts) or the value is set to 0 (stops the addition).	20°C (interval: 5°C / 30°C)
MAXSTEP	Maximum number of permitted steps for auxiliary heating. 0 = no auxiliary heating permitted (Means that only AUTO or ⏻ can be selected and that legionella operation is not possible.)	2 (at AIR 5) (interval: ⏻, 1 / 3) (interval at OUTSIDE AIR: ⏻, 1 / 5)
MAX CURRENT (Expansion card)	Refers to main fuse in the unit, in amperes.	20 (interval: 16 / 35)

Menu selection	Meaning	Factory setting
SHUNTTIME	Minimum time interval between signals to shunt motor to affect the supply temperature, in seconds. Applies to all connected shunt groups (applies to system D or VLD).	60S (interval: 10S / 99S)
HOT WATER STOP	Stop temperature for hot water during ADD. HEAT operation (applies to the VL system). The value is read off by the hot water sensor.	60°C (interval: 50°C / 65°C)

Sub menu SERVICE -> MANUAL TEST

Used to manually test and test operate the heat pump's components or signal outputs.

Menu selection	Meaning	Factory setting
MANUAL TEST	Setting options for manual test. 0 = deactivate manual test 1 = activate manual test 2 = activate manual test with option of navigating from the SERVICE menu to check that the temperatures rise.	-
HEATPUMP	0 = stop heat pump, does not stop started brine pump 1 = start heat pump, also starts brine pump. NOTE! The heat pump cannot be started in the event of an active alarm.	-
BRINEPUMP	0 = stop brine pump 1 = start brine pump	-
CIRC: PUMP	0 = stop circulation pump 1 = start circulation pump	-
VXV HOT WATER	0 = heating mode for 3-way valve 1 = hot water mode for 3-way valve	-
SHUNT 1	- = closes shunt (applies to D-system) 0 = shunt unaffected + = opens shunt (applies to D-system)	-
ADD. HEAT 1	0 = stop auxiliary heat step 1 1 = start auxiliary heat step 1	-
ADD. HEAT 2	0 = stop auxiliary heat step 2 1 = start auxiliary heat step 2	-
ADD. HEAT 3 (***DHP-A, -AL***) (Defrost card)	0 = stop auxiliary heat step 3 1 = start auxiliary heat step 3	-
SHUNT DEFR (***DHP-A, -AL***) (Defrost card)	- = opens flow from the defrost tank 0 = shunt unaffected + = closes the flow from the defrost tank	-
FAN L (Defrost card)	0 = stop fan 1 = start fan with low speed	-
FAN H (Defrost card)	0 = stop fan 1 = start fan with high speed	-
ADD.HEAT EXT (***DHP-A, -AL***) (Defrost card)	0 = 0V on terminal block 283 1 = control voltage 230V on terminal block 283	-

Menu selection	Meaning	Factory setting
ALARM (Expansion card)	0 = stop signal on output External alarm 1 = start signal on output External alarm	-
SHUNT COOLING (Expansion card)	- = shuts shunt 0 = shunt unaffected + = opens shunt	-
SHUNTGROUP (Expansion card)	- = shuts shunt 0 = shunt unaffected + = opens shunt	-
COOLING PASSIVE (Expansion card)	0 = stop passive cooling 1 = start passive cooling (brine pump starts and shunt cooling regulates to set point value)	-
HGW-SHUNT (DHP-H Opti Pro)	- = shuts shunt 0 = shunt unaffected + = opens shunt	-
COOLING ACTIVE (Expansion card)	0 = stop active cooling 1 = start active cooling (brine pump and compressor starts, shunt cooling regulates to set point value)	-
VXV POOL (Expansion card)	0 = normal mode for exchange valve 1 = pool mode for exchange valve	-
0-10V (Expansion card)	For any future demands.	-

Sub menu SERVICE -> INSTALLATION

Used for settings that are set during installation

<table>
<tr><th>Menu selection</th><th>Meaning</th><th>Factory setting</th></tr>
<tr><td>SWEDISH</td><td>Language setting for the control computer.</td><td>SWEDISH

(SVENSKA
NORSK,
SUOMI,
DEUTSCH,
NEDERLANDS,
ENGLISH,
FRANCAIS
POLSKI
DANSK)</td></tr>
<tr><td>SYSTEM

NOTE! The menu selection in the SYSTEM menu varies depending on the selected values. Tip: start in the top menu and work downwards.</td><td colspan="2">Sub menu SERVICE -> INSTALLATION -> SYSTEM:
<table>
<tr><th>Menu selection</th><th>Meaning</th></tr>
<tr><td>HEAT SOURCE</td><td>GROUND OR ROCK
OUTSIDE AIR
<table>
<tr><th>Menu selection</th><th>Meaning</th></tr>
<tr><td>DIRECT EVAPURATION</td><td></td></tr>
<tr><td>BRINE SOLUTION</td><td></td></tr>
</table></td></tr>
<tr><td>HEATING SYSTEM</td><td>VL-SYSTEM
D-SYSTEM
VLD-SYSTEM (appears if OUTSIDE AIR is selected)</td></tr>
<tr><td>COOLING
(Expansion card)</td><td>PASSIVE COOLING: ⏻/EXTERNAL/INTEGRATED IN HP
ACT COOLING: ⏻/EXTERNAL
ROOM SENSOR: 0/1 (Appears if room sensor is installed)
(0=controls to a constant value, 1=controls to the value that the room sensor has)
(The menu option INTEGRATED IN HP only applies to the DHP-C* heat pump)</td></tr>
<tr><td>POOL
(Expansion card)</td><td>ON /⏻
Does not appear if SHUNT GROUP is selected.</td></tr>
<tr><td>SHUNTGROUP
(Expansion card)</td><td>ON /⏻

When ON, HEAT CURVE 2 is activated in the INFORMATION menu. Not displayed if POOL is selected.</td></tr>
<tr><td>ADD. HEAT</td><td>0-10V: ⏻/ EXTERNAL ADDITIONAL HEATER (Expansion card)
FLOW SENSOR: ON /⏻
CURRENT LIMITER: ON /⏻ (Expansion card)
PHASE FAULT: ⏻/ PHASE READING</td></tr>
</table></td></tr>
</table>

Menu selection	Meaning	Factory setting
SERVICETIME	**NOTE!** Only used for test operation. Simulates time 60 times as fast, which means that the waiting times are eliminated during test operation. 0 = deactivates SERVICETIME 1 = activates SERVICETIME which speeds up the control computer's integral calculation and start delay by 60 times.	-
FACTORY SET	0 = starting point, the value returns to zero after a change R = reset factory settings for radiator system G = rest factory settings for under floor heating	-
RESET OPERAT. TIME	0 = no reset of operation times 1 = reset operation times to zero	-
CALIBRATION SENSOR	Following sensors are in the installation: OUTDOOR Supply line Return line HOT WATER BRINE OUT BRINE IN DEFR SENSOR EXTERNAL INFLUENCE (these parameters affect all sensors except the outdoor sensor. The parameter compensates for the external influence on the sensor that is mounted in the heat pump.	 0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) 0 (interval: -5°C / 5°C) -5°C (interval: -5°C / 5°C) 0 (At AIR 5) (interval: 0 / 20)
VERSION	Shows the software version which is stored on the display card respectively the I/O-card. DISPLAY: V X.X I/O-CARD: V X.X	-
LOGTIME	Time interval between collection points of temperature history in minutes. The history graphs always show the 60 last collection points, which means that the graphs can display history from 1 hour up to 60 hours ago. (The function is not active if there is an active alarm).	1M (interval: 1M / 60M)
BRINE TIME ON	Switch on delay for compressor, in seconds.	30S (at internal passive cooling 90S) (interval: 10S / 90S)
BRINE TIME OFF	Switch off delay for brine pump, in seconds.	30S (interval: 10S / 60S)
TOPH. TIME	⏻ = Deactivates time period for peak heating charging (does not apply to system D). ON = Activates time period for peak heating charging (does not apply to system D).	⏻
TOPH.TIME D	Time period to maintain peak heating charging temperature in hours (applies to system D).	1H (interval: 1H / 10H)

Sub menu SERVICE -> DEFROST (*DHP-A, -AL*)

The menu applies to ***DHP-A, -AL*** with defroster card and only appears if OUTDOOR AIR in the SERVICE -> INSTALLATION -> SYSTEM -> HEAT SOURCE menus is selected. Used to change settings for outdoor unit defrost.

Menu selection	Meaning	Factory setting
DEFR CURVE 0	The temperature of the heat pump's brine return at which defrosting should start, at 0°C outdoor temperature is set here, using + or -. The graph can be changed up or down at 0°C outdoor temperature in the display. See section 12.9 for further information.	-10°C (interval: -15°C / -5°C)
DEFR CURVE [value for OUTDOOR STOP]	The temperature of the heat pump's brine return line at which defrosting should start, at the set outdoor temperature for OUTDOOR STOP is set using + or -. The setting is made by reducing the OUTDOOR STOP value by this value. The number of degrees shown after DEFR CURVE in the display is the set value for OUTDOOR STOP. The combined temperature is shown in the top right corner of the display. The graph can be changed up or down at the outdoor temperature OUTDOOR STOP in the display. See section 12.9 for more information.	EXTERIOR STOP reduced by 4°C (interval: -8°C / -1°C)
DEFR TEMPERATURE	The temperature shunted to the outdoor unit during a defrost.	15°C (interval: 14°C / 20°C)
STOP DEFR	The temperature that must be reached in the Brine In sensor to complete a defrost.	11°C (interval: 7°C / 12°C)

Menu selection	Meaning	Factory setting
UNDER 5°C DEFR	Safety defrosting occurs when the outdoor temperature has been below 5° for a set number of days, shunts +20°C for 10 minutes.	7D (interval: ⏻, 1D / 14D)
MIN TIME DEFROST	Minimum time between two defrosts in minutes.	45M (interval: 10M / 60M)
DEFR SENSOR	Shows the actual temperature of the incoming air to the outdoor unit.	-

Sub menu SERVICE -> OPTI (*Opti models*)

The menu applies to Optimum models with speed controlled circulation pumps and only appears if ON in SERVICE -> INSTALLATION -> SYSTEM -> ADDITION -> CONTROLLED CP menu is selected. Used to change the circulations pumps' operating settings.

Menu selection	Meaning	Factory setting
TEMP DIFF CIRC.	Desired temperature difference between supply and return line for the heating system..	8°C (interval: , 0°C / 15°C)
TEMP DIFF BRINE	Desired temperature difference between supply and return line for the brine system.	3°C (interval: , 0°C / 15°C)
START FLOW CIRC.	Speed control of the heating system's circulation pump in Volts. Higher voltage gives a greater circulation pump speed, which gives a lower temperature difference. A low voltage gives a greater difference. 3 - 10 = Manually adjustable speed, where 3 is low voltage and 10 is high voltage.	7V (interval: 3V / 10V)
START FLOW BRINE	Speed control of the brine system's circulation pump in Volts. Higher voltage gives a greater brine pump speed, which gives a lower temperature difference. A low voltage gives a greater difference. 3 - 10 = Manually adjustable speed, where 3 is low voltage and 10 is high voltage.	10V (interval: 3V / 10V)
CONST. FL. CIRC.	If TEMP DIFF CIRC is set to XX the flow is continuous with this value in the heating system. Value indicated in Volts.	7V (interval: 3V / 10V)
CONST. FL. BRINE	If TEMP DIFF BRINE is set to XX the flow is continuous with this value in the brine system. Value indicated in Volts.	10V (interval: 3V / 10V)
MIN FLOW CIRC.	Lowest permitted voltage (speed) of the circulation pump's flow in the heating system. If there is no heat demand, there may still be a demand to read in the temperatures for the sensors in the system and the circulation pump therefore must be run.	3V (interval: 3V / 10V)-
MAX H.W CHARGE	Highest supply temperature during water heating.	55°C (interval: 50°C / 65°C)
MIN H.W CHARGE	Lowest desired supply temperature during water heating.	50°C (interval: 30°C / 65°C)

Sub menu SERVICE ->HGW *(DHP-H Opti Pro)*

The menu applies to the DHP-H Opti Pro model with de-superheater and only appears if ON in SERVICE -> INSTALLATION -> SYSTEM -> ADDITION -> HGW SHUNT menu is selected. Used to change the de-superheater's operating settings.

Menyval	Betydelse	Fabriksinställning
HGW TEMP.	Shows the HGW sensor after the de-superheater (the supply temperature to water heater) in °C.	-
TEMP DIFF.	Desired difference between the HGW sensor and water heater's start sensor.	20K (interval: 15K / 35K)
HOT WATER DIFF.	Shows actual difference between the HGW sensor and water heater's start sensor.	-
HOT WATER TO RAD.	If there is a heat demand, the HGW shunt switches to the heating system when the weighted value is greater than the total of the START temperature for hot water and this value. Example: 40°+3K = at a temperature of 43°C in the water heater, the shunt switches to the heating system.	3K (interval: 1K / 10K)

Menyval	Betydelse	Fabriksinställning
MAX TEMP.	Max temperature of the water in the water heater. The temperature is measured on the peak sensor in the water heater. NOTE! Domestic hot water can have this temperature, which can mean that an external mixer valve may be required.	95°C (interval: 60°C / 100°C)
START HGW	The number of seconds the HGW shunt is to open at HGW start is the starting point of shunt opening. The opening time for the HGW shunt from fully closed to fully open towards the water heater is 30 seconds.	7S (interval: 0S / 30S)
INITIALIZING HGW	The time in seconds before control of HGW shunt starts after HGW start.	60S (interval: 10S / 90S)
INTEGRAL DELAY	Delay of integral calculation in seconds after the integral value for HGW has been reached.	10S (interval: 5S / 120S)
HGW-SHUNT TIME	The time that the signal is active to open or close the HGW shunt completely.	35S (interval: 15S / 60S)
HGW INT. BOUND.	Integral value (parameter) for HGW.	60 (interval: 10 / 120)
HGW INTEGRAL	Shows the actual value for the HGW integral. Plus indicates that the shunt opens towards the hot water heater and minus indicates that the shunt opens towards the heating system.	-
PULSE WIDTH	How long the plus or minus signal to the shunt is to be high when the HGW integral has been reached.	0,25S (interval: 0,20S / 1,00S)
PULSES	Shows the relevant position for the shunt from the starting point for START HGW. At start-up the value is zero and for each + pulse that is sent to the sensor, the value goes up one step. For - pulse, the value goes down one step.	-

15 Troubleshooting

15.1 Alarm list

Shown in display in the event of an alarm. To reset alarms 1-5, set the operating mode to OFF or cut the power supply.

Message	Meaning
HIGHPRESS ERROR	Tripped high pressure switch. Compressor stopped. No hot water production.
LOWPRESS ERROR	Tripped low pressure switch. Compressor stopped. No hot water production.
MOTOR P ERROR	Deployed motor protection (Over current relay compressor). Compressor stopped. No hot water production.
BRINE OUT	Brine out is less than the set minimum temperature. Compressor stopped. No hot water production.
BRINEFLOW LOW	Flow sensor not active during last start. Compressor stopped. No hot water production.
ADD. HEAT	Overheating protection deployed. No additional heat.
SENSOR OUTDOOR	Fault in outside sensor. Zero degrees used for calculations.
SENSOR FRONT	Supply line sensor error. Everything stops except the heating system's circulation pump.
SENSOR RETURN	Return sensor fault. Return temperature = Supply line – 5 is used. Calculated supply temperature limited to maximum 45°C.
SENSOR HOT WATER	Fault on sensor for start temperature. No hot water production.
SENSOR DEFROST	Defrost sensor fault. Heat and hot water production is controlled from the outdoor sensor's value instead. (Applies to DHP-A, -AL)
MS FAN	Deployed motor protection for outdoor unit fan. Compressor stopped. No hot water production. (Applies to DHP-A, -AL)
SENSOR COOLING	Sensor fault. Cooling function stops.

15.2 Measurement points

Conversion table for sensors

NOTE! When reading the resistance of the sensors, the sensor leads must first be disconnected from the control equipment.

Outdoor sensor	
°C	ohm, Ω
-30	1884
-25	1443
-20	1115
-15	868
-10	681
-5	538
0	428
5	343
10	276
15	224
20	183
25	150
30	124
35	103
40	86

Other sensors	
°C	kilo ohm, kΩ
0	66.3
5	52.4
10	41.8
15	33.5
20	27.1
25	22.0
30	18.0
35	14.8
40	12.2
45	10.1
50	8.5
55	7.1
60	6.0
65	5.0
70	4.2
75	3.7
80	3.1
85	2.7
90	2.3
95	2.0

1. Disconnect the sensor cable at the I/O card.
2. First measure the sensor including the cable.
3. Then measure the sensor only.

15.3 Check points

Temperatures

Name	Values
Condensing temperature	0.5 – 1.5 °C above supply line temperature
Evaporation temperature	7 - 8 °C lower than incoming brine
Overheating	4 - 8 K temperature difference
Radiator circuit	5 - 10 K temperature difference
Brine circuit	2 - 5 K temperature difference
Overheating R407C	4K ±1 K

Expansion valve factory setting

Name	Setting
Danfoss TUBE R404A, 4.2 kW	From fully closed position, screw 3 turns out
Danfoss TUBE R404A, 5.6 kW	From fully closed position, screw 5.5 turns out
Danfoss TUBE R404A, 8.4 kW	From fully closed position, screw 5 turns out
Danfoss TUBE R404A, 12.0 kW	From fully closed position, screw 5.25 turns out
Danfoss TUBE R404A, 15.3 kW	From fully closed position, screw 2.75 turns out
Danfoss TUBE R407C, 11.0 kW	From fully closed position, screw 6.25 turns out
Danfoss TUBE R407C, 17.0 kW	From fully closed position, screw 5.5 turns out

Break pressure pressure switches

Refrigerant	Pressostat	Break pressure
R407C	Low pressure switch	0.08 MPa
	Operating pressure switch A	2.65 MPa
	Operating pressure switch B	2.85 MPa
	High pressure switch	3.10 MPa
R134a (Only applies for certain models of DHP-C)	Low pressure switch	0.03 MPa
	Operating pressostat	1.80 MPa
	High pressure switch	2.45 MPa
R404A (Only applies to DHP-A, -AL)	Low pressure switch	0.08 MPa
	Operating pressure switch A	2.65 MPa
	Operating pressure switch B	2.85 MPa
	High pressure switch	3.10 MPa

15.4 Operational problems

Problem – Alarm LP (low pressure pressure switch)

Cause	Troubleshooting	Remedy
1. Blocked strainer on the brine circuit.	Check that the strainer is not blocked.	Clean the strainer if necessary.
2. Air in the brine circuit.	Listen for air in the heat pump and brine circuit.	Bleed the brine circuit according to the installation instructions.
3. Closed taps, main tap or filler cock on the brine circuit.	Check that the shut-off cock/any other taps are open.	Open closed taps.
4. The circulation pump for the brine circuit is defective or has jammed.	Check: • That the circulation pump spins. • That the shut-off valves are open. • That the strainer is not blocked. • That no air is in the heating system.	The circulation pump may have jammed, if so, open the bleed screw and try to release the paddle wheel using a screwdriver for example. Open closed valves or taps. Check, and, if necessary, clean the strainer. If necessary, bleed the heating system according to the installation instructions
5. Cable break or loose cable to low pressure pressure switch.	• Check that both cables are connected on the pressure switch. • Using the buzzer, check that there are no cable breaks. In order to do this, disconnect the cables from the pressure switch and circuit board.	If a cable has come loose, connect it. If there is a cable break, replace the cable.

Cause	Troubleshooting	Remedy
6. The low pressure pressure switch opens too soon.	• Incorrect pressure switch installed. Higher break pressure than intended. See marking. • Pressure switch fault, opens at a higher pressure than indicated (mark pressure). Check using the manometer apparatus. • Defective pressure switch, always open.	If the low pressure pressure switch opens too soon or is always open, replace it.
7. Incorrect type of anti-freeze, must be in accordance with instructions.	Check that the correct type of anti-freeze is used.	If the incorrect type of anti-freeze is used, the entire system must be drained and refilled with a new mixture.
8. Incorrect mix of anti-freeze, the concentration must be in accordance with instructions.	Check the freezing point of the mix using a refractometer.	If the mixture is not in accordance with the instructions, it must be remixed in an external container. This is because the fluids do not mix with each other well if one is filled directly into the system.
9. Short active collector, e.g. short or dry bore hole, short surface soil collector.	• Check the length of the collector that is being used and compare with the collector length in the dimensioning documentation. • In addition, check that the collector is not suspended ”in free air” if boreholes are used.	If the active collector is too short, the heat pump cannot receive enough energy from the heat source, which results in it requiring an addition to cover the energy requirement.
10. Collector too long, pressure drop too great.	Check the length of the collector that is being used and that it is connected in parallel (not connected in series) if more than 1 coil is being used.	If a longer collector is being used than recommended for the specific heat pump, it must be divided on several parallel connected coils.
11. Expansion valve defective or incorrectly set.	Using manometer apparatus and thermometer check what the overheating reading of the unit is. Also check that bulb and capillary tube are undamaged and that the bulb is correctly installed.	If the overheating reading does not correspond with the instructions for the specific refrigerant, adjust the expansion valve until the correct value is obtained. See separate instructions for cooling techniques. If overheating cannot be adjusted with the expansion valve or if the capillary tube/bulb is damaged, replace it.
12. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit’s overheating is correct for the specific refrigerant.	Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action.
13. Drying filter blockage.	Check the temperature difference above the drying filter. A one degree difference is permissible. If the difference is greater than 1 degree, the filter is blocked. Take a reading during operation.	If the drying filter is blocked, replace it.
14. Blocked evaporator on the water side.	If there is no strainer in the brine circuit, there is a risk of dirt sticking in the evaporator and blocking it. Unfortunately there is no easy way of checking if the evaporator is blocked. You can carry out a test by allowing the compressor and circulation pumps to remain in operation. Check that the circulation pumps work (for circ.pumps with a venting screw, unscrew it and feel if the pump rotor rotates using a screwdriver). Then read the temperature on both connection pipes to the evaporator: If the temperature difference is <1°C, the evaporator is probably blocked. If the temperature difference is 2-6°C, it is probably not blocked. If the temperature difference is >6°C, the evaporator is probably blocked.	If the evaporator is thought to be blocked, try flushing it. If this does not work, it must be replaced
15. Blocked evaporator on the refrigerant side.	Using manometer apparatus and thermometer, check that the unit’s overheating is correct for the specific refrigerant.	If the evaporator is thought to be blocked by oil for example, try blowing nitrogen through it to release the oil. If this does not work, it must be replaced

Problem – Alarm HP (high pressure pressure switch)

Cause	Troubleshooting	Remedy
1. Blocked strainer in the heating system.	Check that the strainer is not blocked.	Clean the strainer if necessary.
2. Air in the heating system.	Listen for air in the heat pump and heating system.	Bleed the heating system circuit according to the installation instructions.
3. Closed or partially closed thermostats/ valves in the heating system.	Check that the thermostats/valves in the heating system are open.	Open closed thermostats/valves.
4. The circulation pump that is defective or has jammed.	Is there voltage to the circulation pump?	In the control computer's manual test menu check that the circulation pump is active. Check if there is voltage to the circulation pump, if there is, and it does not run, the circulation pump is jammed. If this is the case, open the bleed screw and try to release the paddle wheel using a screwdriver for example (Does not apply to heat pumps in the Optimum series). If there is no voltage to the circulation pump, check if there is voltage from the control computer, see wiring diagram. If there is voltage from the control computer, check the components between the control computer and circulation pump. If a component is defective, replace it.
5. Shut-off main tap in heating system.	Check that the main tap is open.	Open closed main tap.
6. Cable break or loose cable to high pressure pressure switch.	• Check that both cables are connected on the pressure switch. • Using the buzzer, check that there are no cable breaks. In order to do this, disconnect the cables from the pressure switch and circuit board.	If a cable has come loose, connect it. If there is a cable break, replace the cable.
7. The operating pressure switch does not open.	• Incorrect pressure switch installed. Same or higher break pressure than high pressure pressure switch. See marking. • Pressure switch fault, opens at a higher pressure than indicated (mark pressure). Check using the manometer apparatus. • Defective pressure switch, never opens.	If the operating pressure switch does not open, replace it.
8. The high pressure pressure switch opens too soon.	• Incorrect pressure switch installed. As low or lower break pressure than operating pressure switch. See marking. • Pressure switch fault, opens at a lower pressure than indicated (mark pressure). Check using the manometer apparatus. • Defective pressure switch, always open.	If the high pressure pressure switch opens too soon or is always open, replace it.
9. External system shunt that closes on time setting.	Check for shunts or valves in the system, which are timer-controlled, that close down the entire or too large a part of the heating system.	Always ensure that there is a sufficiently large water volume for the heat pump to work against, i.e. for the heat to give off its heat to.
10. Incorrectly facing non-return valve with too high opening pressure.	• Check the system's direction of flow and that the non-return valve is turned the correct way. • Check that the heat pump's external available pressure exceeds the non-return valve's opening pressure.	If the non-return valve is facing the wrong way, turn it. If the non-return valve has too great an opening pressure, replace it.
11. Large pressure drop in the heating system.	• Dirt in the heating system. • Closed or partially closed thermostats/valves in the heating system. • Under dimensioned pipe system. Check that the HP's external available pressure exceeds the system pressure drop.	If necessary, clean/flush the heating system. Open closed thermostats/valves. If there is not sufficient pressure equipment, the heating system can be adjusted according to the system solution for large pressure drop.

Cause	Troubleshooting	Remedy
12. Overfilled refrigerant circuit.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action.
13. Blocked condenser on the water side.	If there is no strainer in the heating system, there is a risk of dirt sticking in the condenser and blocking it. Unfortunately there is no easy way of checking if the condenser is blocked. You can carry out a test by allowing the compressor and circulation pumps to remain in operation and after a while, check that the delivery pipe becomes hot and that the circulation pumps work (for circ.pumps with a venting screw, unscrew it and feel if the pump rotor rotates using a screwdriver). Then read the temperature on both connection pipes to the condenser: If the temperature difference is <3°C, the condenser is probably blocked. If the temperature difference is 3-13°C, it is probably not blocked. If the temperature difference is >13°C, the condenser is probably blocked.	If the condenser is thought to be blocked, try flushing it. If this does not work, it must be replaced
14. Blocked condenser on the refrigerant side.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	If the condenser is thought to be blocked by oil for example, try blowing nitrogen through it to release the oil. If this does not work, it must be replaced

Problem – Alarm MS (motor protection)

Cause	Troubleshooting	Remedy
1. Phase drop or blown fuse.	Check that all phases are present on the terminal block for incoming supply. If not, check the fuses in the cabinet. Also check that all wiring is secure, if screw terminals are used they must be properly tightened, if phoenix flat spring terminals are used, the cables must be secure in the correct hole with load on the cable.	If any of the phases are not present, check backwards towards the building's main electrical cabinet. If there are no phases there, contact the network supplier.
2. Defective soft-starter.	Measurement check and establish that when the control computer gives a signal (there must be voltage between A1 & A2 on the soft-starter), the soft-starter releases all three phases down to the compressor.	If the soft-starter does not release the phases when it receives signals from the control computer, replace it.
3. Defective contactor.	Measurement check and establish that when the control computer gives a signal (there must be voltage between A1 & A2 on the contactor), the contactor releases all three phases down to the compressor.	If the contactor does not release the phases when it receives signals from the control computer, replace it.
4. Defective or incorrectly set motor protection.	Use a hook-on meter to establish when the motor protection deploys, check what the motor protection is set to. Compare with the table.	If the motor protection is defective, replace it. If incorrectly set, adjust to the correct value.
5. Cable break.	Check the supply to the motor protection// soft-starter/compressor.	If a cable is damaged, replace it.

Cause	Troubleshooting	Remedy
6. Defective compressor.	Measurement check the voltage on the three phases (each to zero) at the compressor. Deviations from the average of the three values should not be more than 12% on any of the phases. If measurement checking the winding's impedance the same value must be on all three windings.	If the compressor is defective, replace it.

Problem – Alarm sensor (all)

Cause	Troubleshooting	Remedy
Sensor fault alternatively cable fault.	• When reading the resistance of the sensors, the sensor leads must first be disconnected from the control equipment or terminal block. • First take a reading from the sensor including cable and check against the ohm table in the Measurement points section. • If the read off value does not correspond with the table, only measure the sensor and check the ohm table in the Measurement points section.	If the sensor gives a correct value, the cable is defective. If the sensor does not give a correct value, the sensor is defective.

Problem – Incorrect phase sequence

Cause	Troubleshooting	Remedy
The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps).	• If the text ERR PHASE SEQ appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the delivery pipe temperature by feeling the delivery pipe that should be hot (not just warm) even a little distance from the compressor if the phases are correctly sequenced. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards.	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.

Problem – Alarm TS (addition)

Cause	Troubleshooting	Remedy
1. The overheating protection has tripped.	Check if the overheating protection has tripped.	If the overheating protection has tripped, reset it.
2. Phase drop. The alarm occurs when 230 V is not registered between L2 on the circuit board and N (220).	• Check if the overheating protection has tripped. • Check if any cables at the circuit board or overheating protection are loose or damaged.	If the overheating protection has tripped, reset it. If the cables are loose/damaged, secure or replace them.
3. Overheating protection fault, cannot be reset.	Press the reset button, measurement check for 230 V on the incoming and outgoing connections.	If the overheating protection is defective, replace it.
4. Flow sensor fault.	Check what the flow sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the Measurement points section.	If the sensor is defective, replace it.

Cause	Troubleshooting	Remedy
5. No or insufficient circulation in the heating system.	• That the strainer is not blocked. • That no air is in the heating system.	The circulation pump may have jammed, if so, open the bleed screw and try to release the paddle wheel using a screwdriver for example. Open closed valves or taps. Check, and, if necessary, clean the strainer. If necessary, bleed the heating system according to the installation instructions.
6. The submersible tube in the electric heating element is against the coils.	Check what the flow temperature is when the overheating protection trips. It normally trips at about 95°C.	The submersible tube can be prised out slightly from the coils using a screwdriver or similar. The submersible tube must be vertical.

Problem – Alarm Brine out

Cause	Troubleshooting	Remedy
1. Defective sensor.	Check what the sensor shows, is it a plausible/ actual value? Measure the resistance of the sensor, check against the ohm table in the Measurement points section.	If the sensor is defective, replace it.
2. Brine temperature too low.	Check the set value on ALARM BRINE in the heat pump's control computer.	The alarm is triggered when the temperature on BRINE OUT is as low or lower than the set value on ALARM BRINE. In the factory setting this function is inactive.

Problem – Alarm Brine flow low

Cause	Troubleshooting	Remedy
1. Incorrect system selected in the control computer. If the system does not contain a flow switch but the control computer is set for the system with flow switch, this alarm occurs.	In the menu SYSTEM, check which is selected.	If the incorrect system is selected, change it.
2. Insufficient flow.	• Check whether the ground water pump is running? • Check the flow switch. • Calibration/setting the flow switch. • Blocked exchanger?	The ground water pump must start and run together with the heat pump's integrated brine pump. Check against the wiring diagram that the flow switch is correctly connected. Check that the flow switch is set for the correct working range according to the flow switch instructions. If the exchanger is blocked, clean or replace it.

Problem – Operating pressure switch open alternatively high hot gas temperature
(indicated by med □ in the display's lower left corner)

Cause	Troubleshooting	Remedy
1. The operating pressure switch does not close again.	1. Switch off the main switch for the heat pump, wait until the compressor has been stationary for at least 15 minutes. 2. Disconnect the two cables on the pressure switch, using a buzzer check if the pressure switch is closed.	If the pressure switch is closed, bridge the pressure switch cables temporarily and switch on the current to the heat pump again. If there is an indication in the display this means that the pressure switch is fault-free and the problem is in the wiring or in the circuit board. If the pressure switch is open, try carefully tapping the head of the pressure switch with a screwdriver and use a buzzer test to see if it has closed again. Replace the pressure switch if it appears to jam repeatedly.
2. Sensor fault, shows >120°C	Check what the sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the Measurement points section.	If the sensor is defective, replace it.
3. Hot gas temperature too high.	Check the set value on DELIVERY PIPE in the heat pump's control computer (factory setting 120°C)	The square symbol appears when the delivery pipe temperature is as high or greater than the set value for DELIVERY PIPE.
4. Overheating too high.	Using manometer apparatus and thermometer check what the overheating reading of the unit is. Also check that bulb and capillary tube are undamaged and that the bulb is correctly installed.	If the overheating reading does not correspond with the instructions for the specific refrigerant, adjust the expansion valve until the correct value is obtained. See separate instructions for cooling techniques. If overheating cannot be adjusted with the expansion valve or if the capillary tube/bulb is damaged, replace it.
5. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.

LEAKAGE

Problem – Leak fluid side

Cause	Troubleshooting	Remedy
1. Insufficiently tightened connections.	Locate the leak.	• Tighten the connection and check that it is sealed • If it is still not sealed, replace the entire connection and support sleeve (only at soft pipes)
2. Cracked nut or connection.	Locate the leak.	Replace nut or connection.
3. Defective gasket or O-ring.	Locate the leak.	Replace the gasket or O-ring.
4. There is no overflow pipe connected to the safety valve(s).	Establish which safety valve does not have an overflow pipe.	Install an overflow pipe according to the applicable norms.
5. Filler valve between incoming cold water and heating system not closed or leaking.	Check whether water continuously leaks from the safety valve on the expansion vessel on the hot side.	Try closing the filler valve and see if water stops dripping from the safety valve, if not, replace the filler valve.
6. No condensation drain to heat pump's drip tray.	Check that condensation drain is installed and correctly connected.	Install the condensation drain that runs out into the floor drain.

Cause	Troubleshooting	Remedy
7. Lack of condensation insulation on cold water pipe and/or brine pipe.	Establish where the condensation is coming from.	The brine pipe must always be insulated. In the event of problems with condensation on the cold water pipes, insulate them. Condensation often accumulates in joints and angled sections of the insulation. Improve the insulation.
8. Leak at soldered joints.	Locate the leak.	Drain the system of fluid, repair the leak. If the leak is on the connection pipe to the heat exchanger, also drain the refrigerant side.
9. Leak at the condenser's drain cock.	1. Check that the valve is completely closed. 2. Check that the sealed cover is sealed.	If the sealed cover is not sealed, replace the sealed cover or the entire drain tap.
10. Leak at the condenser's bleed valve.	Check that it is completely closed.	If it is fully closed and still leaks, replace it.
11. Leak at soldered joint on water heater.	Locate the leak.	If there is a leak at the soldered joint, replace the water heater.
12. Associated leak on the water heater.	• Establish whether water continuously leaks from the safety valve on the expansion vessel on the hot side. • Establish whether water continuously leaks from the safety valve on the cold side.	If the water heater has a leak, replace it.
13. Associated leakage in the condenser.	• Check for lack of refrigerant in the unit. • Check by smelling by safety valve on the hot side, open the valve and check.	If the condenser has a leak, replace it.
14. Anti-freeze is forced out of the safety valve on the expansion tank (brine system).	During the winter, water surrounding the hoses in the borehole can freeze. In some cases, the ice can push against the hoses slightly. Due to the reduction in volume in the hose, the anti-freeze fills the expansion tank and eventually forces some fluid out of the safety valve. When the ice in the borehole melts and the hose expands and returns to its original state, a vacuum is generated which results in a reduction in tank level. As the safety valve does not let any air in, the expansion tank can retract inwards due to the vacuum created.	To prevent anti-freeze from being forced out from the safety valve, you can exchange the existing expansion tank for a closed pressure expansion vessel with a greater volume. To prevent the expansion tank retracting inwards, a vacuum valve can be installed in the system.

NOISE

Problem – Noise problem in the radiator system

Cause	Troubleshooting	Remedy
1. Flexible hoses missing.	Flexible hoses must be installed according to the instructions.	Install flexible hoses according to the instructions.
2. Incorrectly installed flexible hoses.	Flexible hoses must be installed according to the instructions.	Install flexible hoses according to the instructions.
3. Installing/suspending pipes.	Check if the mountings are too rigid, right type, right sizes and/or installed too close together.	If something seems to be incorrect according to the troubleshooting window, carry out corrective actions.
4. Clicking.	• Establish when clicking occurs, during heating and/or in connection with completed hot water production? • Locate the clicking noises.	A surge tank can be installed on the supply line to mix the hot water with the existing, slightly cooler, water, before it goes out to the radiators. Try lubricating lead-ins in walls, ceilings and floors with silicone spray.

Cause	Troubleshooting	Remedy
5. Circulation noise (whistling noise in the heating system).	Check the heating system. • Closed valves, choke valves, adjuster valves or other restrictions in the radiator system can cause circulation noise. • Is the heating system correctly adjusted for flow? • Too great a flow in the heating system can cause circulation noise.	If the incorrect type of valve is used to choke the flow, replace with the correct type. If the heating system is not correctly adjusted, make adjustments. Can the heating system be run at a lower flow?

Problem – Loud compressor noise

Cause	Troubleshooting	Remedy
1. Phase drop. The compressor attempts to start or operates on two phases.	1. Check that there is 400 V between incoming phases on the heat pump. 2. If there is supply to the heat pump, measure the voltage for all electrical components all the way to the compressor, see wiring diagram.	Check where the phase drop is and rectify.
2. Touching pipes – vibrations.	Establish which pipe(s) is/are causing the problem.	Try to release any tensions that cause the vibrations.
3. Compressor fault.	Determine whether the compressor is unusually loud.	If the compressor is defective, replace it.

Problem – Shrieking whistling noise

Cause	Troubleshooting	Remedy
1. Whistling expansion valve.	1. Take overheating readings, adjust to the recommended value. 2. Open and close the valve fully in and out. 3. Adjust the expansion valve to recommended overheating value again.	Check if the noise has stopped, if not, continue with point 2. Continue with point 3. If the problem persists, replace the expansion valve.
2. Noise from the soft-starter.	Measurement check the input and output phases for the soft-starter as well as the control signals from the control computer, see wiring diagram.	If the soft-starter is defective, replace it.
3. The compressor's IPR valve opens.	The compressor has an integrated IPR valve that opens at 28 ±3 bar. When the valve opens, pressure equalizes between the compressor's high and low pressure side and a milling/whistling sound is heard. To establish whether the valve opens at the correct pressure, connect a manometer on the high and low pressure side. When the valve opens, this is indicated by the pressure on the low pressure side rising and reaching the pressure on the high pressure side. Check at what pressure the valve starts to open.	If it opens at a too low pressure, replace the compressor.

Problem – Noise – miscellaneous

Cause	Troubleshooting	Remedy
1. Vibrating protective sleeves on the pressure switches.	Establish where the vibration noise is coming from.	Prevent the protection sleeve vibrating by using insulation tape for example.
2. Vibration noise from the electrical installation.	Check for electrical steps or similar devices screwed to the heat pump and wall. These can cause vibrations and noise.	Carry out according to the installation instructions.
3. The heat pump is not level.	Check that the heat pump is level by using a spirit level. Check that the heat pump is supported by all four feet	If the heat pump is not level, adjust using the feet.

HOT WATER

Problem – Temperature and/or quantity

Cause	Troubleshooting	Remedy
1. Defective 3-way valve motor.	Check the function of the 3-way valve, that it runs between the end positions by running a manual test.	If the motor is defective, replace it.
2. Jammed 3-way valve insert. The valve is not secure and releases hot water to the radiators during hot water production.	Detach the motor and test closing and opening of the valve by pressing the control arm	If the insert jams, remove and clean it, or replace it.
3. Air in TWS coil or water outer jacket.	During hot water production: • Listen for air. • Check the temperature difference between supply and return line.	Bleed the system. A Large temperature difference can indicate air in the system.
4. Start temperature set too high for hot water production.	Check that the start temperature is correctly set. Should not be set above the factory set value.	• If the start value is set too high, reduce it to the factory set value. • If the system has a high (>+8°C) brine temperature, you may have to reduce the start value further for a longer running time.
5. Sensor fault, hot water sensor. Hot water production is started by the hot water sensor.	Check what the hot water sensor (the start sensor) shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the Measurement points section.	If the sensor is defective, replace it.
6. Large drain flow (>12l/min).	Check how many litres of hot water (approx. 40°C) per minute drains from the tap. Use a clock and bucket to measure the drain flow.	If the drain water flow is greater than 12l/min, stratification in the water heater is affected, which reduces the hot water capacity. Suggested corrective actions: • Install a pressure reduction valve on the incoming cold water pipe. • Change to a mixer with lower flow. • Adjust the drain flow on the existing mixer, do not open the tap fully.
7. Water heater too small in relation to requirement.	How large is the requirement and what is the capacity of the heater?	Replace with a larger heater or supplement with an extra heater. E.G. supplement with an MBH TWS or an electric heater.
8. The operating pressure switch opens too soon (at too low a pressure). Hot water production ends when the operating pressure switch opens.	Check the break pressure using manometer apparatus.	If the pressure switch opens at the incorrect pressure, replace it. The replacement pressure switch can be installed on the service output (Schrader valve)

Cause	Troubleshooting	Remedy
9. Insufficient exchange surface to transfer the heat pump's output to the heater. (Only applies to heat pumps with a separate heater)	Is the exchange surface too small? Can the heater cope with the heat pump's output?	Replace with a heater with a larger exchange surface.
10. Heat loss in the hot water pipe.	Open the hot water tap, read off the temperature on the outgoing hot water pipe from the heat pump and the temperature of the hot water. The temperature difference measured between the heat pump and hot water indicates the temperature loss. Examples of temperature loss causes: • Long water pipes. • Uninsulated hot water pipes. • Hot water pipes routed through cold areas. Other causes that can affect the hot water temperature: • Is a mixer valve installed in the system? Temperature set too low on the mixer valve? Leaking mixer valve? • Water tap fault? Leaking thermostat mixer?	If any problems occur during troubleshooting as per the points, carry out corrective actions. To quickly check that the heat pump's hot water production works as it should, drain the hot water so that the heat pump starts to produce the hot water. When done, read off the temperature on the top sensor and on the start sensor. The top sensor should show a temperature of around 50-55°C and the start sensor around 45-48°C. If, after completed hot water production, these temperatures are obtained, this means that you have the correct temperature and volume of hot water in the water heater.

HEATING COMFORT

Problem – Too cold

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE and MAX settings.	Adjust incorrect values in the heat pump's control computer. ROOM = Desired indoor temperature CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature. MAX = Highest set-point value on the supply line regardless of the outdoor temperature.
2. Incorrect operating mode set in the heat pump's control computer.	Check which operating mode is set.	If the incorrect operating mode is set, change to the desired operating mode.
3. Sensor fault, OUTDOOR/ROOM/Supply line/Return line.	Check what the relevant sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the Measurement points section.	If the sensor is defective, replace it.
4. The 3-way valve has jammed in hot water mode.	1. Check the function of the 3-way valve motor by test running it manually. If the motor does not shift mode during manual test operation, check that there is voltage to the motor, see wiring diagram. 2. Detach the motor and test closing and opening of the valve by pressing the control arm.	1. Is the motor being supplied with voltage according to the wiring diagram in both operating instances? MANUAL TEST – VXV HOT WATER 0=Radiator mode, arm out from valve. 1=Hot water mode, arm positioned towards the valve. If there is voltage to the motor but the arm does not shift mode, replace it. 2. Take out and clean the jammed insert, or replace with a new insert.
5. Defective electric heating element.	Use a buzzer and check if all coils in the electric heating element are intact.	If the electric heating element is defective, replace it.

Cause	Troubleshooting	Remedy
6. The heat pump has stopped on HIGH RETURN.	• Check what the MAX RETURN value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return line sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in the Measurement points section.	If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it. If the sensor is defective, replace it.
7. Heat production is stopped by the HYSTERESIS function.	If the flow temperature rises as soon as heat production is stopped by HYSTERESIS before INTEGRAL reaches 0, there may be heating deficit in the house. • Check if heat production stops because the hysteresis value is set too low? (See the installation instructions for factory setting.) • Check if heat production stops because thermostats/valves in the heating system are closed or partially closed? • Check if heat production stops because the heating system is under dimensioned?	• Try increasing the hysteresis value until the heat pump stops on INTEGRAL instead. • Open thermostats/valves in the heating system and check that the heat pump stops on INTEGRAL. • If the heating system is deemed to be under dimensioned, the system must be extended (increase the heat emitting surface).
8. The auxiliary heater is not permitted to cut in with sufficient output. Value set too low on MAXSTEP. MAXSTEP 1 = 3 kW MAXSTEP 2 = 6 kW MAXSTEP 3 = 9 kW MAXSTEP 4 = 12 kW (only DHP-A) MAXSTEP 5 = 15 kW (only DHP-A) MAXSTEP +4 = 12 kW (only DHP-A) MAXSTEP +5 = 15 kW (only DHP-A)	Check the set value on MAXSTEP in the heat pump's control computer.	If necessary, adjust the MAXSTEP value in the heat pump's control computer. MAXSTEP 1 = 3 kW MAXSTEP 2 = 6 kW MAXSTEP 3 = 9 kW MAXSTEP 4 = 12 kW (only DHP-A, -AL, cannot cut in when the compressor is running.) MAXSTEP 5 = 15 kW (only DHP-A, -AL, cannot cut in when the compressor is running.) MAXSTEP +4 = 12 kW (only DHP-A, -AL, can cut in when the compressor is running.) MAXSTEP +5 = 15 kW (only DHP-A, -AL, can cut in when the compressor is running.)
9. The external auxiliary heater does not start when the heat pump's control computer requests it.	If an external auxiliary heater is used, check that it is correctly installed by test running it in MANUAL TEST – ADD.HEAT - 1. If it does not start at manual test operation, check that the start signal/voltage comes from the heat pump. See wiring diagram.	Connect the external auxiliary heater according to the instructions. Measure the voltage on the control computer's probe L2 Oil/Electricity.
10. Closed or partially closed thermostats/valves in the heating system.	Check that the thermostats/valves in the heating system are open.	Open closed thermostats/valves.
11. The total output of the heat pump and auxiliary heater is too low in relation to the building's power demand.	What is the building's power demand? What is the output of the heat pump? What is the output of the auxiliary heater, what is it set to?	Ensure that available power is at least as great as the building's power demand.
12. Under dimensioned heating system.	Check existing heating system. What output is it dimensioned for to produce at what supply temperature? What output is required to keep the room warm?	If the heating system is dimensioned for greater supply temperatures than the heat pump can provide, it must be adjusted by increasing the heat emitting surface for example. If the room requires a higher output than the heating system can provide, extend the heating system.

Cause	Troubleshooting	Remedy
13. Changed conditions. Have you increased your heating and/or hot water demand?	• If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems).	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Too hot

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE and MIN settings.	Adjust incorrect values in the heat pump's control computer. ROOM = Desired indoor temperature. CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature. MIN = Lowest set-point value on the supply line regardless of the outdoor temperature.
2. Sensor fault, OUTDOOR/ROOM/Supply line.	Check what the relevant sensor shows, is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in the Measurement points section.	If the sensor is defective, replace it.
3. Defective 3-way valve motor. The motor should set the valve to the relevant end position depending on operating conditions. If it does not, hot water from the water heater will mix with the radiator water.	Check the function of the 3-way valve motor by test running it manually. If the motor does not shift mode during manual test operation, check that there is voltage to the motor, see wiring diagram.	Is the motor being supplied with voltage according to the wiring diagram in both operating instances? MANUAL TEST – VXV HOT WATER 0=Radiator mode, arm out from valve. 1=Hot water mode, arm positioned towards the valve. If there is voltage to the motor but the arm does not shift mode, replace it.
4. Jammed 3-way valve insert. If the insert is not sealed, hot water from the water heater will mix with the radiator water.	Detach the motor and test closing and opening of the valve by pressing the control arm.	Take out and clean the jammed insert, or replace with a new insert.

Problem – Irregular indoor temperature

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE, MIN, MAX CURVE5, CURVE0, CURVE-5 and HEATSTOP settings.	Adjust incorrect values in the heat pump's control computer. ROOM = Desired indoor temperature CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature. MIN = Lowest set-point value on the supply line regardless of the outdoor temperature (on the condition that heat-stop does not apply). MAX = Highest set-point value on the supply line regardless of the outdoor temperature. CURVE5,0,-5 = The supply temperature can be adjusted up or down 5°C at these outdoor temperatures. HEATSTOP = Stops all production of heat when the outdoor temperature is the same as or greater than the set value. To exit heat-stop the outdoor temperature must drop to 3°C below the set value.
2. Incorrectly positioned/installed sensors.	Check that outdoor sensors and any room sensors are installed according to the instructions and that they are calibrated.	• Check that the room sensor is positioned in a suitable place that is representative of the building and calibrate it if necessary. Avoid placing near external doors, windows and heat sources. • Install the outdoor sensor according to the instructions and calibrate it, if necessary.

OTHER

Problem – The heat pump runs and runs but never stops

Cause	Troubleshooting	Remedy
1. Air in the heating system.	Listen for air in the heat pump and heating system.	Bleed the heating system circuit according to the installation instructions.
2. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.
3. Changed conditions. Have you increased your heating and/or hot water demand?	• If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems).	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Runs on electric heating element

Cause	Troubleshooting	Remedy
1. Operating mode ADD.HEAT is selected.	If this operating mode is selected, the auxiliary heater is used for heating and hot water production, not the compressor.	If ADD.HEAT mode is selected and you no longer want it, change to AUTO, the heat pump then controls both the compressor and auxiliary heater.
2. The compressor cannot run due to an alarm.	Check the alarm that is indicated in the display.	Rectify the problem and rest the alarm. See the Operational problem – Alarm, section.
3. The integral value has reached the start level for the auxiliary heater.	Check what the integral value is in the control computer.	If the auxiliary heater is in operation because the integral value has counted down to the start value, the computer reacts as it should, see the Heat pump for further information.
4. Peak heat operation (legionella function) is running.	Check if the heat pump runs peak heat. See the instructions for the relevant model.	Peak heat operation occurs in connection with hot water production with the set interval. The compressor should then start to produce hot water and 2 minutes later the auxiliary heater starts, the compressor should then stop and the stop temperature is reached with only the auxiliary heater connected. Take no corrective action.
5. The heat pump has stopped on HIGH RETURN.	• Check what the MAX RETURN value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return line sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in the Measurement points section.	If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it. If the sensor is defective, replace it.
6. The compressor runs backwards. The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps). If the compressor runs backwards, it will not cope with compressing the refrigerant and therefore does not produce the correct power, which leads to the control computer requesting auxiliary heating.	• If the text ERR PHASE SEQ appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the delivery pipe temperature by feeling the delivery pipe that should be hot (not just warm) even a little distance from the compressor if the phases are correctly sequenced. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards.	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.
7. Changed conditions. Have you increased your heating and/or hot water demand?	• If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems).	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – The auxiliary heater is in operation but not the compressor

Cause	Troubleshooting	Remedy
1. Operating mode ADD.HEAT is selected.	If this operating mode is selected, the auxiliary heater is used for heating and hot water production, not the compressor.	If ADD.HEAT mode is selected and you no longer want it, change to AUTO, the heat pump then controls both the compressor and auxiliary heater.
2. Peak heat operation (legionella function) is running.	Check if the heat pump runs peak heat. See the instructions for the relevant model.	Peak heat operation occurs in connection with hot water production with the set interval. The compressor should then start to produce hot water and 2 minutes later the auxiliary heater starts, the compressor should then stop and the stop temperature is reached with only the auxiliary heater connected. Take no corrective action, this is normal.
3. The compressor cannot run due to an alarm.	Check the alarm that is indicated in the display.	Rectify the problem and rest the alarm. See the Operational problem – Alarm, section.
4. The heat pump has stopped on high return.	• Check what the MAX value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return line sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in the Measurement points section.	• If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it. • If the sensor is defective, replace it.
5. The compressor has been stopped by the operating pressure switch or delivery pipe sensor.	Check if a square appears in the display's lower let corner, if so, the operating pressure switch is open or the delivery pipe sensor triggers an alarm for too high temperature. • The operating pressure switch is most easily checked by using a buzzer to see if it is connected. • The delivery pipe sensor value is read off from the control computer in the HEATPUMP menu. Is it a plausible/actual value? If not, take a resistance reading from the sensor and check against the ohm table in the Measurement points section. • The compressor has been stopped by the delivery pipe sensor and you have established that it shows the correct temperature. This may have been caused by a leak in the refrigerant circuit.	If the operating pressure switch has stuck in the open position, try gently tapping on the pressure switch head. If this does not help, or it sticks in the open position repeatedly, replace the pressure switch. If the delivery pipe sensor is defective, replace it. If the delivery pipe temperature gets so hot that the compressor stops, start by leak-tracing the unit. Rectify the leak, if a leak is found. If no leak is found, try draining and refilling the unit and then restarting the heat pump and seeing what the delivery pipe temperature is. If the problem persists, replace the compressor.
6. The built-in overheating protection (bi-metal protection) in the compressor has tripped.	Check if the heat pump's control computer indicates that the compressor is in operation, and if there is voltage between soft-starters A1 and A2. Then read off and check that there is voltage on the compressor's three electrical connections (L1, L2 and L3).	If there is voltage on the compressor's three electrical connections and the overheating protection does not close when the compressor has not run and has cooled down for at least 1 hour, replace the compressor.

Cause	Troubleshooting	Remedy
7. The compressor runs backwards. The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps). If the compressor runs backwards, it will not cope with compressing the refrigerant and therefore does not produce the correct power, which leads to the control computer requesting auxiliary heating.	• If the text ERR PHASE SEQ appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the delivery pipe temperature by feeling the delivery pipe that should be hot (not just warm) even a little distance from the compressor if the phases are correctly sequenced. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards.	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.

Problem – The heat pump consumes too much energy

Cause	Troubleshooting	Remedy
1. Blocked strainer in the heating system.	Check that the strainer is not blocked.	Clean the strainer if necessary.
2. The compressor cannot run due to an alarm.	Check the alarm that is indicated in the display.	Rectify the problem and rest the alarm. See the Operational problem – Alarm, section.
3. Incorrect flow over hot side of the heat pump.	Measurement check what the difference between the supply and return line is using a thermometer (Δt). The difference should be about 7-10°C (can vary depending on refrigerant). A lower Δt results in reduced efficiency in the heat pump.	Adjust the system to obtain the correct Δt.
4. Incorrect flow in the brine circuit.	Measurement check what the difference between the supply and return line is using a thermometer (Δt). The difference should not be more than 4°C. A greater Δt results in reduced efficiency in the heat pump.	If the difference is greater than 4°C note what is causing it. E.G.: Dirt in the filter, system restrictions, system with high pressure drop.
5. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM and CURVE and MIN settings.	Adjust incorrect values in the heat pump's control computer. ROOM = Desired indoor temperature. CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature. MIN = Lowest set-point value on the supply line regardless of the outdoor temperature.
6. The interval for peak heat operation has changed to a lower value than the factory set value. This results in the heat pump going into peak heat operation more often than calculated.	Check the specified interval for peak heat operation in the control computer, see instructions for relevant model.	If there is a shorter interval between the peak heat productions, this explains why the unit consumes more current than calculated, but this does not mean for sure that it should be increased, there might be a reason why the interval has been changed.
7. The heat pump has stopped on HIGH RETURN.	• Check what the MAX RETURN value is set at in the heat pump's control computer. It must be adjusted to the unit's maximum supply temperature and the system's delta temperature so that it does not cut at too high a return temperature when the highest supply temperature is transmitted. • Check what the return line sensor shows, is it a plausible/actual value? If not, take a resistance reading from the sensors and check against the ohm table in the Measurement points section.	If the MAX RETURN value is not adjusted for the system according to the troubleshooting window, adjust it. If the sensor is defective, replace it.

Cause	Troubleshooting	Remedy
8. The compressor runs backwards. The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps). If the compressor runs backwards, it will not cope with compressing the refrigerant and therefore does not produce the correct power, which leads to the control computer requesting auxiliary heating.	• If the text ERR PHASE SEQ appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. • When the compressor is running, check the delivery pipe temperature by feeling the delivery pipe that should be hot (not just warm) even a little distance from the compressor if the phases are correctly sequenced. • When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards.	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.
9. The compressor has been stopped by the operating pressure switch or delivery pipe sensor.	Check if a square appears in the display's lower let corner, if so, the operating pressure switch is open or the delivery pipe sensor triggers an alarm for too high temperature. • The operating pressure switch is most easily checked by using a buzzer to see if it is connected. • The delivery pipe sensor value is read off from the control computer in the HEATPUMP menu. Is it a plausible/actual value? If not, take a resistance reading from the sensor and check against the ohm table in the installation instructions. • The compressor has been stopped by the delivery pipe sensor and you have established that it shows the correct temperature. This may have been caused by a leak in the refrigerant circuit.	If the operating pressure switch has stuck in the open position, try gently tapping on the pressure switch head. If this does not help, or it sticks in the open position repeatedly, replace the pressure switch. If the delivery pipe sensor is defective, replace it. If the delivery pipe temperature gets so hot that the compressor stops, start by leak-tracing the unit. Rectify the leak, if a leak is found. If no leak is found, try draining and refilling the unit and then restarting the heat pump and seeing what the delivery pipe temperature is. If the problem persists, replace the compressor.
10. Expansion valve defective or incorrectly set.	Using manometer apparatus and thermometer check what the overheating reading of the unit is. Also check that bulb and capillary tube are undamaged and that the bulb is correctly installed.	If the overheating reading does not correspond with the instructions for the specific refrigerant, adjust the expansion valve until the correct value is obtained. See separate instructions for cooling techniques. If overheating cannot be adjusted with the expansion valve or if the capillary tube/bulb is damaged, replace it.
11. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.
12. Overfilled refrigerant circuit.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	If cooling is not at the correct level compared with the specific refrigerant and is too high, there is too much refrigerant in the unit. Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant.
13. Short active collector, e.g. short or dry bore hole, short surface soil collector.	• Check the length of the collector that is being used and compare with the collector length in the dimensioning documentation. • In addition, check that the collector is not suspended "in free air" if boreholes are used.	If the active collector is too short, the heat pump cannot receive enough energy from the heat source, which results in it requiring an addition to cover the energy requirement.

Cause	Troubleshooting	Remedy
14. Changed conditions. Have you increased your heating and/or hot water demand?	• If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems).	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Auxiliary heater cuts in too soon

Cause	Troubleshooting	Remedy
1. The heat pump's control computer is not set/adjusted to the customer's requirements/wishes.	Check the ROOM, CURVE, INTEGRAL A1 and INTEGRAL A2 settings	Adjust incorrect values in the heat pump's control computer. ROOM = Desired indoor temperature. CURVE = Should be set so that the desired indoor temperature (ROOM) is maintained regardless of the outdoor temperature. INTEGRAL A1 = Start value for the compressor. INTEGRAL A2 = Start value (calculated from A1) for the auxiliary heater.
2. Lack of refrigerant, not enough refrigerant in the system.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.
3. Short active collector, e.g. short or dry bore hole, short surface soil collector.	• Check the length of the collector that is being used and compare with the collector length in the dimensioning documentation. • In addition, check that the collector is not suspended "in free air" if boreholes are used.	If the active collector is too short, the heat pump cannot receive enough energy from the heat source, which results in it requiring an addition to cover the energy requirement.
4. Collector too long, pressure drop too great.	Check the length of the collector that is being used and that it is connected in parallel (not connected in series) if more than 1 coil is being used.	If a longer collector is being used than recommended for the specific heat pump, it must be divided on several parallel connected coils.
5. Changed conditions. Have you increased your heating and/or hot water demand?	• If the heat pump has been dimensioned for a certain demand and this demand is increased, the heat pump might not be able to maintain the desired room temperature. • If hot water consumption increases, a larger proportion of time is used to produce hot water, which means less time for heat production (only applies to VL-systems).	If the heat pump cannot cope with the demand, replace it with one with a higher output or supplement it with a higher output auxiliary heater.

Problem – Short operating times despite heating demand

Cause	Troubleshooting	Remedy
ROOM and/or CURVE set too high in combination with a heating system with poor circulation due to closed radiator valves, too small elements or insufficient water volume. A tight fitting system with poor pipe dimensions may produce the same phenomena.	Check if the heat pumps starts, if the supply temperature rises quickly whilst nothing happens to the return temperature. If this happens and the heat pump is stopped by the hysteresis function to later drop in temperature (supply) as quickly to start again, but cannot due to time conditions in regulation, this means that the heat pump cannot transport the heat away from the condenser as it should. In such a case, hysteresis starts and stops the heat pump often.	Adjust ROOM and CURVE if necessary, ensure that there is sufficient flow over the condenser and the heating circuit.

Problem – Connection of external AH

Cause	Troubleshooting	Remedy
Incorrectly connected auxiliary heater. Does not start when the control computer gives the signal.	Check the connection against the instructions/wiring diagram. Test the function in manual mode.	If the auxiliary heater is incorrectly connected, reconnect according to the instructions.

OUTDOOR UNIT

Problem – Noise/loud noise

Cause	Troubleshooting	Remedy
1. Positioning the outdoor unit.	Determine whether the outdoor unit can be moved to a more suitable location.	When positioning the outdoor unit, its direction does not affect its performance. The outdoor unit does not need to be positioned as close to the heat pump as necessary, it can be positioned as far as 30 ”pipe metres” way.
2. Connection/wall lead-ins.	Check that the unit is installed according to the instructions. Is the outdoor unit secured to the wall?	Rigid mountings can generate noise from the outdoor section via walls in the house.

Problem – Defrosting problems

Cause	Troubleshooting	Remedy
1. Location/calibration of the outdoor sensor.	Check that the outdoor sensor is installed according to the installation instructions and that it is correctly calibrated.	Install according to the instructions and calibrate, if necessary. Alternatively, the outdoor sensor can be located behind the outdoor unit 20 cm out from the rear side of the outdoor unit.
2. Brine temperature in/out.	Measurement check the temperatures with a thermometer.	If necessary, calibrate BRINE IN and BRINE OUT in the heat pump’s control computer.
3. The defroster shunt does not regulate as it should.	Manually test to check if the defroster shunt opens and closes the flow over the defroster tank. If the motor switches position when testing, but defrosting still does not function, remove the motor and try closing and opening the valve by hand by pressing in the control arm.	If the motor is defective, replace it. If the insert jams, remove and clean/lubricate it, or replace it.

Problem – Build-up of ice under and around the outdoor unit

Cause	Troubleshooting	Remedy
Insufficient drainage.	Does a lot of ice accumulate under and around the outdoor unit because the melted water has no where to run?	Drain the ground under and around the outdoor section or Install a drip tray with a drainpipe routed to an indoor drain or gully. NOTE! A heating cable may have to be installed in the drainpipe.

Problem – Water run-off by the outdoor unit, risk of moisture problems in house foundations

Cause	Troubleshooting	Remedy
Insufficient drainage.	During some periods when the outdoor unit is being defrosted, large amounts (20-40 L/day) of water can run off.	Drain the ground under and around the outdoor unit so that it can cope with the extra amount of water produced because of defrosting or Install a drip tray with a drainpipe routed to an indoor drain or gully. NOTE! A heating cable may have to be installed in the drainpipe.

16 Technical data

DHP-A, DHP-AL			***6***	***8***	***10***	***12***
Refrigerant	Type		R404A	R404A	R404A	R404A
	Amount	kg	0,95	1,45	1,50	1,60
	Test pressure	MPa	3,4	3,4	3,4	3,4
	Design pressure	MPa	3,1	3,1	3,1	3,1
Compressor	Type		Scroll	Scroll	Scroll	Scroll
	Oil		POE	POE	POE	POE
Electrical data 3-N~50Hz	Main supply	Volt	400V 3N ~50Hz	400V 3N ~50Hz	400V 3N ~50Hz	400V 3N ~50Hz
	Total power input [1]	kW	2,00	2,30	3,60	4,40
	Power input, circ.pumps [1]	W	0,43	0,61	0,66	0,7
	Auxiliary heater, 3 steps	kW	3 / 6 / 9 / 12 / 15	3 / 6 / 9 / 12 / 15	3 / 6 / 9 / 12 / 15	3 / 6 / 9 / 12 / 15
	Start current	A	14,0	25,0	29,0	32,0
	Total current [1]	A				
	Circuit breaker	A	10[3]/16[4]/20[5]/20[6]/ 25[7]/25[14]/30[15]	16[3]/16[4]/20[5]/20[6]/ 25[7]/25[14]/30[15]	16[3]/16[4]/20[5]/20[6]/ 25[7]/30[14]/35[15]	16[3]/20[4]/25[5]/25[6]/ 25[7]/30[14]/35[15]
Electrical data 1-N~50Hz	Main supply	Volt	230V 1N ~50Hz	230V 1N ~50Hz	230V 1N ~50Hz	230V 1N ~50Hz
	Total power input [1]	kW	3,3	4,2	5,4	5,7
	Power input, circ.pumps	W	0,3	0,48	0,48	0,52
	Auxiliary heater, 3 steps	kW	1,5 / 3,0 / 4,5	1,5 / 3,0 / 4,5	1,5 / 3,0 / 4,5	1,5 / 3,0 / 4,5
	Start current	A	58	76	97	108
	Total current [1]	A	25[3]/32[4]/40[5]	25[3]/32[4]/40[5]	32[3]/40[4]/50[5]	32[3]/40[4]/50[5]
	Circuit breaker	A	5,00	7,02	8,20	9,84
Performance	Output capacity [1]	kW	2,85	3,1	2,85	3
	Heat factor [1]	COP	5,90	7,96	9,85	11,3
	Output capacity [2]	kW	3,26	3,40	3,29	3,40
	Heat factor [2]	COP	1,8	2,3	3,0	3,4
Nominal flow [8]	Cooling circuit	l/s	0,32	0,49	0,58	0,64
	Heating circuit	l/s	0.14	0.20	0.24	0.28
Pressure drop	Condensor	kPa	7	8	9	15
	Evaporator	kPa	21	31	44	17
External available pressure [9]	Cooling circuit	kPa	46	83	69	95
	Heating circuit	kPa	46	43	42	34
Lowest outdoor temperature allowed for compressor start		°C	-20	-20	-20	-20
Max/min temperature	Cooling circuit	°C	20/-25	20/-25	20/-25	20/-25
	Heating circuit	°C	59 / 20	59 / 20	59 / 20	59 / 20
Pressure switches	Low pressure	MPa	0,08	0,08	0,08	0,08
	Operating	MPa	2.65 / 2.85	2.65 / 2.85	2.65 / 2.85	2.65 / 2.85
	High pressure	MPa	3,1	3,1	3,1	3,1
Water volume	Condensor	l	1,22	2,11	2,66	2,66
	Evaporator	l	1,00	1,22	1,22	1,55
Fan speed outdoor unit,low/high		rpm	500 / 650	500 / 650	500 / 800	500 / 800
Air flow		m^3/h	2500 / 3200	2500 / 3200	2500 / 3900	2500 / 3900
Sound power level [10]		dB(A)	53 / 63	53 / 63	54 / 67	54 / 67
Fan power input		W				
Sound pressure level away from outdoor unit [11]	1 m [13]	dB(A)	90 / 130	90 / 130	120 / 180	120 / 180
	4 m [13]	dB(A)	41 / 51	41 / 51	42 / 55	42 / 55
	8 m [14]	dB(A)	27 / 37	27 / 37	28 / 41	28 / 41
	16 m [14]	dB(A)	21 / 31	21 / 31	22 / 35	22 / 35
Max.pipe lenght (Cu pipe Ø28mm between heat pump and outdoor unit)		m	210 (105+105)	131 (65+65)	70 (35+35)	76 (38+38)
Anti freeze media [12]			Etylenglykol	Etylenglykol	Etylenglykol	Etylenglykol
Water heater volume		l	180	180	180	180
Weight / outdoor unit		kg	260 / 94	260 / 94	260 / 94	268 / 94
Weight		kg	154 / 120	154 / 120	154 / 120	162 / 120

The measurements are performed on a limited number of heat pumps which can cause variations in the results. Tolerances in the measuring methods can also cause variations.

1) At A2W35 according to EN 14511 (including circulation pumps and outdoor unit).

2) At A7W35 according to EN 14511 (including circulation pumps and outdoor unit).

3) Heat pump with 3 kW auxiliary heater (1-N 1.5 kW).

4) Heat pump with 6 kW auxiliary heater (1-N 3 kW).

5) Heat pump with 9 kW auxiliary heater (1-N 4.5 kW).

6) 12 kW auxiliary heater (compressor off).

7) 15 kW auxiliary heater (compressor off).

8) Nominal flow: heating circuit Δ10K, cooling circuit Δ3K.

9) Pressure drop that must not be exceeded outside the heat pump without the nominal flow being reduced.

10) Sound power level (outdoor unit) measured according to EN ISO 3741.

11) Sound pressure level calculated according to EN ISO 11203.

12) For DHP-A, -AL models, do not use propylene glycol or ethanol.

13) Calculated from sound power level with the assumption of a semi-spherical propagation from a point source.

14) 12 kW auxiliary heater (compressor allowed).

15) 15 kW auxiliary heater (compressor allowed).

DHP-A Opti, DHP-AL Opti			***6***	***8***	***10***	***12***
Refrigerant	Type		R404A	R404A	R404A	R404A
	Amount	kg	0.95	1.45	1.50	1.60
	Test pressure	MPa	3.4	3.4	3.4	3.4
	Design pressure	MPa	3.1	3.1	3.1	3.1
Compressor	Type		Scroll	Scroll	Scroll	Scroll
	Oil		POE	POE	POE	POE
Electrical data 3-N~50Hz	Main supply	Volt	400	400	400	400
	Total power input [1]	kW	2.0	2.30	3.60	4.40
	Power input, circ.pumps [1]	W	0.41	0.41	0.46	0.63
	Auxiliary heater, 3 steps	kW	3/6/9/12/15	3/6/9/12/15	3/6/9/12/15	3/6/9/12/15
	Start current	A	14.0	25.0	29.0	32.0
	Total current [1]	A				
	Circuit breaker	A	10[3]/16[4]/20[5]/20[6]/ 25[7]/25[14]/30[15]	16[3]/16[4]/20[5]/20[6]/ 25[7]/25[14]/30[15]	16[3]/16[4]/20[5]/ 20[6]/ 25[7]/30[14]/35[15]	16[3]/20[4]/25[5]/ 25[6]/ 25[7]/30[14]/35[15]
Electrical data 1-N~50Hz	Main supply	Volt	230	230	230	230
	Total power input [1]	kW	3.3	4.2	5.4	5.7
	Power input, circ.pumps	W	0.41	0.41	0.46	0.63
	Auxiliary heater, 3 steps	kW	1.5/3/4.5	1.5/3/4.5	1.5/3/4.5	1.5/3/4.5
	Start current	A	58	76	97	108
	Total current [1]	A				
	Circuit breaker	A	25[3]/32[4]/40[5]	25[3]/32[4]/40[5]	32[3]/40[4]/50[5]	32[3]/40[4]/50[5]
Performance	Output capacity [1]	kW	5.00	7.02	8.20	9.84
	Heat factor [1]	COP	2.85	3.10	2.85	3.00
	Output capacity [2]	kW	5.90	7.96	9.85	11.3
	Heat factor [2]	COP	3.26	3.40	3.29	3.40
	Power input	kW				
Nominal flow [8]	Cooling circuit	l/s	1.8	2.3	3.0	3.4
	Heating circuit	l/s	0.20	0.30	0.60	0.5
Pressure drop	Condensor	kPa	0.14	0.20	0.24	0.28
	Evaporator	kPa	7	8	9	15
External available pressure [9]	Cooling circuit	kPa	21	31	44	17
	Heating circuit	kPa	88	74	56	98
Lowest outdoor temperature allowed for compressor start		°C	103	43	42	34
Max/min temperature	Cooling circuit	°C	-20	-20	-20	-20
	Heating circuit	°C	20/-25	20/-25	20/-25	20/-25
Pressure switches	Low pressure	MPa	59/20	59/20	59/20	59/20
	Operating	MPa	0.08	0.08	0.08	0.08
	High pressure	MPa	2.65/2.85	2.65/2.85	2.65/2.85	2.65/2.85
Water volume	Condensor	l	3.1	3.1	3.1	3.1
	Evaporator	l	1.22	2.11	2.66	2.66
Fan speed outdoor unit,low/high		rpm	1.00	1.22	1.22	1.55
Air flow		m^3/h	500/650	500/650	500/800	500/800
Sound power level [10]		dB(A)	2500/3200	2500/3200	2500/3900	2500/3900
Fan power input		W	53/63	53/63	54/67	54/67
Sound pressure level away from outdoor unit [11]	1 m [13]	dB(A)	90/130	90/130	120/180	120/180
	4 m [13]	dB(A)	41/51	451/51	42/55	42/55
	8 m [14]	dB(A)	27/37	27/37	28/41	28/41
	16 m [14]	dB(A)	21/31	21/31	22/35	22/35
Max.pipe lenght (Cu pipe Ø28mm between heat pump and outdoor unit)		m	210 (105+105)	131 (65+65)	70 (35+35)	76 (38+38)
Anti freeze media [12]			Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol
Water heater volume		l	180	180	180	180
Weight / outdoor unit		kg	260/94	260/94	260/94	268/94
Weight		kg	154/120	154/120	154/120	162/120

The measurements are performed on a limited number of heat pumps which can cause variations in the results. Tolerances in the measuring methods can also cause variations.

1) At A2W35 according to EN 14511 (including circulation pumps and outdoor unit).

2) At A7W35 according to EN 14511 (including circulation pumps and outdoor unit).

3) Heat pump with 3 kW auxiliary heater (1-N 1.5 kW).

4) Heat pump with 6 kW auxiliary heater (1-N 3 kW).

5) Heat pump with 9 kW auxiliary heater (1-N 4.5 kW).

6) 12 kW auxiliary heater (compressor off).

7) 15 kW auxiliary heater (compressor off).

8) Nominal flow: heating circuit Δ10K, cooling circuit Δ3K.

9) Pressure drop that must not be exceeded outside the heat pump without the nominal flow being reduced.

10) Sound power level (outdoor unit) measured according to EN ISO 3741.

11) Sound pressure level calculated according to EN ISO 11203.

12) For DHP-A, -AL models, do not use propylene glycol or ethanol.

13) Calculated from sound power level with the assumption of a semi-spherical propagation from a point source.

14) 12 kW auxiliary heater (compressor allowed).

15) 15 kW auxiliary heater (compressor allowed).

DHP-H, DHP-L			4	6	8	10	12	16
Refrigerant	Type		R407C	R407C	R407C	R407C	R407C	R407C
	Amount	kg	0,75	1,2	1,3	1,45	1,55	2
	Test pressure	MPa	3,4	3,4	3,4	3,4	3,4	3,4
	Design pressure	MPa	3,1	3,1	3,1	3,1	3,1	3,1
Compressor	Type		Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
	Oil		POE	POE	POE	POE	POE	POE
Electrical data 3-N~50Hz	Main supply	Volt	400	400	400	400	400	400
	Total power input [1]	kW	2,7	2	2,3	3,6	4,4	5,6
	Power input, circ.pumps [1]	W	0,2	0,3	0,3	0,5	0,6	0,6
	Auxiliary heater, 3 steps	kW	3/6/9	3/6/9	3/6/9	3/6/9	3/6/9	3/6/9
	Start current	A	17	12	10	18	17	18
	Total current [1]	A						
	Circuit breaker	A	1x16[9] 10[4]/10[5]/16[6]	10[4]/16[5]/20[6]	16[4]/16[5]/20[6]	16[4]/16[5]/20[6]	16[4]/20[5]/25[6]	20[4]/20[5]/25[6]
Electrical data 1-N~50Hz	Main supply	Volt	230	230	230	230	230	*
	Total power input [1]	kW	2,7	3,3	4,2	5,4	5,7	*
	Power input, circ.pumps	W	0,2	0,3	0,3	0,5	0,6	*
	Auxiliary heater, 3 steps	kW	1,5/3,0/4,5	1,5/3,0/4,5	1,5/3,0/4,5	1,5/3,0/4,5	1,5/3,0/4,5	*
	Start current	A	19	58	76	97	108	*
	Total current [1]	A						
	Circuit breaker	A	20[4]/25[5]/32[6]	25[4]/32[5]/40[6]	25[4]/32[5]/40[6]	32[4]/40[5]/50[6]	32[4]/40[5]/50[6]	*
Performance	Output capacity [1]	kW	3,52	5,33	7,51	9,40	11,00	16,8
	Heat factor [1]	COP	3,90	4,04	4,34	4,24	4,20	4,19
	Output capacity [2]	kW	3,42	5,38	7,40	9,24	10,60	16,3
	Heat factor [2]	COP	3,05	3,41	3,57	3,51	3,39	3,51
	Power input	kW	0,90	1,32	1,73	2,22	2,62	4,01
Nominal flow [6]	Cooling circuit	l/s	0,20	0,36	0,49	0,62	0,71	1,02
	Heating circuit	l/s	0,09	0,14	0,19	0,24	0,28	0,39
External available pressure [5]	Cooling circuit	kPa	37	39	39	78	70	37
	Heating circuit	kPa	52	51	44	40	59	54
Max/min temperature	Cooling circuit	°C	20/-10	20/-10	20/-10	20/-10	20/-10	20/-10
	Heating circuit	°C	60/20	60/20	60/20	60/20	60/20	60/20
Pressure switches	Low pressure	MPa	0,08	0,08	0,08	0,08	0,08	0,08
	Operating	MPa	2.65/2.85	2.65/2.85	2.65/2.85	2.65/2.85	2.65/2.85	2.65/2.85
	High pressure	MPa	3,1	3,1	3,1	3,1	3,1	3,1
Water volume	Condensor	l	0,78	1,55	1,89	2,11	2,11	2,89
	Evaporator	l	0,67	0,67	1,22	1,55	1,55	2,22
Anti freeze media [12]			Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol
Water heater volume [8]		l	180	180	180	180	180	180
Weight		kg	225/140	229/145	229/150	229/155	238/165	242/175

The measurements are performed on a limited number of heat pumps which can cause variations in the results. Tolerances in the measuring methods can also cause variations.
1) According to IEC61000 (including circulation pumps).
2) At B0W35 according to EN 14511 (including circulation pumps).
3) At B0W45 according to EN 14511 (including circulation pumps).
4) Heat pump with 3 kW auxiliary heater (1-N 1.5 kW).
5) Heat pump with 6 kW auxiliary heater (1-N 3 kW).
6) Heat pump with 9 kW auxiliary heater (1-N 4.5 kW).
7) Pressure drop that must not be exceeded outside the heat pump without the nominal flow being reduced. For the cooling circuit these values require a pipe of Ø 40x2.4.
8) Nominal flow: heating circuit Δ10K, cooling circuit Δ3K.
9) Fuse protection phase L1 (size 4 is equipped with an 1-phase compressor)
10) Only DHP-H.
**) Not available in 230V 1-N version.*

DHP-L Opti			***6***	***8***	***10***	***12***	***16***
Refrigerant	Type		R407C	R407C	R407C	R407C	R407C
	Amount	kg	1,2	1,3	1,45	1,55	2
	Test pressure	MPa	3,4	3,4	3,4	3,4	3,4
	Design pressure	MPa	3,1	3,1	3,1	3,1	3,1
Compressor	Type		Scroll	Scroll	Scroll	Scroll	Scroll
	Oil		POE	POE	POE	POE	POE
Electrical data 3-N~50Hz	Main supply	Volt	400	400	400	400	400
	Total power input [1]	kW	2	2,3	3,6	4,4	5,6
	Power input, circ.pumps [1]	W	0,28	0,28	0,28	0,28	0,45
	Auxiliary heater, 3 steps	kW	3/6/9	3/6/9	3/6/9	3/6/9	3/6/9
	Start current	A	12	10	18	17	18
	Circuit breaker	A	10[4]/16[5]/20[6]	16[4]/16[5]/20[6]	16[4]/16[5]/20[6]	16[4]/20[5]/25[6]	20[4]/20[5]/25[6]
Electrical data 1-N~50Hz	Main supply	Volt	230	230	230	230	*
	Total power input [1]	kW	3,3	4,2	5,4	5,7	*
	Power input, circ.pumps	W	0,28	0,28	0,28	0,28	*
	Auxiliary heater, 3 steps	kW	1,5/3,0/4,5	1,5/3,0/4,5	1,5/3,0/4,5	1,5/3,0/4,5	*
	Start current	A	58	76	97	108	*
	Circuit breaker	A	254/325/406	254/325/406	324/405/506	324/405/506	*
Performance	Output capacity [9]	kW	5,33	7,51	9,40	11,00	16,80
	Heat factor	COP	4,04	4,34	4,24	4,20	4,19
		kW	5,38	7,40	9,24	10,60	16,26
		COP	3,41	3,57	3,51	3,39	3,51
		kW	1,32	1,73	2,22	2,62	4,01
Nominal flow [6]	Cooling circuit	l/s	0,36	0,49	0,62	0,71	1,02
	Heating circuit	l/s	0,14	0,19	0,24	0,28	0,39
External available pressure [5]	Cooling circuit	kPa	80	80	63	45	52
	Heating circuit	kPa	105	103	100	102	96
Max/min temperature	Cooling circuit	°C	20/-10	20/-10	20/-10	20/-10	20/-10
	Heating circuit	°C	60/20	60/20	60/20	60/20	60/20
Pressure switches	Low pressure	MPa	0,08	0,08	0,08	0,08	0,08
	Operating	MPa	2.65/2.85	2.65/2.85	2.65/2.85	2.65/2.85	2.65/2.85
	High pressure	MPa	3,1	3,1	3,1	3,1	3,1
Water volume	Condensor	l	1,55	1,89	2,11	2,11	2,89
	Evaporator	l	0,67	1,22	1,55	1,55	2,22
Anti freeze media			Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol
Water heater volume [9]		l	180	180	180	180	180
Vikt		kg	229/145	229/150	229/155	238/165	242/175

The measurements are performed on a limited number of heat pumps which can cause variations in the results. Tolerances in the measuring methods can also cause variations.
1) According to IEC61000 (including circulation pumps).
2) At B0W35 according to EN 14511 (including circulation pumps).
3) At B0W45 according to EN 14511 (including circulation pumps).
4) Heat pump with 3 kW auxiliary heater (1-N 1.5 kW).
5) Heat pump with 6 kW auxiliary heater (1-N 3 kW).
6) Heat pump with 9 kW auxiliary heater (1-N 4.5 kW).
7) Pressure drop that must not be exceeded outside the heat pump without the nominal flow being reduced. For the cooling circuit these values require a pipe of Ø 40x2.4.
8) Nominal flow: heating circuit Δ10K, cooling circuit Δ3K.
9) Fuse protection phase L1 (size 4 is equipped with an 1-phase compressor)
10) Only DHP-H.
**) Not available in 230V 1-N version.*

DHP-H Opti Pro

Refrigerant	Type		R407C	R407C	R407C	R407C	R407C
	Amount	kg	1,15	1,3	1,4	1,55	1,7
	Test pressure	MPa	3,4	3,4	3,4	3,4	3,4
	Design pressure	MPa	3,1	3,1	3,1	3,1	3,1
Compressor	Type		Scroll	Scroll	Scroll	Scroll	Scroll
	Oil		POE	POE	POE	POE	POE
Electrical data 3-N~50Hz	Main supply	Volt	400	400	400	400	400
	Total power input [1]	kW	2	2,3	3,6	4,4	5,6
	Power input, circ.pumps [1]	W	0,28	0,28	0,28	0,28	0,45
	Auxiliary heater, 3 steps	kW	3/6/9	3/6/9	3/6/9	3/6/9	3/6/9
	Start current	A	12	10	18	17	18
	Total current [1]	A					
	Circuit breaker	A	10[4]/16[5]/20[6]	16[4]/16[5]/20[6]	16[4]/16[5]/20[6]	16[4]/20[5]/25[6]	20[4]/20[5]/25
Electrical data 1-N~50Hz	Main supply	Volt	230	230	230	230	*
	Total power input [1]	kW	3,3	4,2	5,4	5,7	*
	Power input, circ.pumps	W	0,28	0,28	0,28	0,28	*
	Auxiliary heater, 3 steps	kW	1,5/3,0/4,5	1,5/3,0/4,5	1,5/3,0/4,5	1,5/3,0/4,5	*
	Start current	A	58	76	97	108	*
	Total current [1]	A					
	Circuit breaker	A	25[4]/32[5]/40[6]	25[4]/32[5]/40[6]	32[4]/40[5]/50[6]	32[4]/40[5]/50[6]	*
Performance	Output capacity [2]	kW	5,33	7,51	9,40	11,00	16,80
	Heat factor [2]	COP	4,04	4,34	4,24	4,20	4,19
	Output capacity [3]	kW	5,38	7,40	9,24	10,60	16,26
	Heat factor [3]	COP	3,41	3,57	3,51	3,39	3,51
	Power input	kW	1,32	1,73	2,22	2,62	4,01
Nominal flow [6]	Cooling circuit	l/s	0,36	0,49	0,62	0,71	1,02
	Heating circuit	l/s	0,14	0,19	0,24	0,28	0,39
External available pressure [5]	Cooling circuit	kPa	80	80	63	45	52
	Heating circuit	kPa	105	103	100	102	96
Max/min temperature	Cooling circuit	°C	20/-10	20/-10	20/-10	20/-10	20/-10
	Heating circuit	°C	60/20	60/20	60/20	60/20	60/20
Pressure switches	Low pressure	MPa	0,08	0,08	0,08	0,08	0,08
	Operating	MPa	2.65/2.85	2.65/2.85	2.65/2.85	2.65/2.85	2.65/2.85
	High pressure	MPa	3,1	3,1	3,1	3,1	3,1
Water volume	Condensor	l	1,55	2,11	2,11	2,66	2,89
	Evaporator	l	0,67	1,22	1,55	1,55	2,22
	Hot gas heat exchanger	l	0,21	0,21	0,21	0,21	0,21
Anti freeze media			Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol	Etylenglykol/ Etanol
Water heater volume [9]		l	180	180	180	180	180

The measurements are performed on a limited number of heat pumps which can cause variations in the results. Tolerances in the measuring methods can also cause variations.
1) According to IEC61000 (including circulation pumps).
2) At B0W35 according to EN 14511 (including circulation pumps).
3) At B0W45 according to EN 14511 (including circulation pumps).
4) Heat pump with 3 kW auxiliary heater (1-N 1.5 kW).
5) Heat pump with 6 kW auxiliary heater (1-N 3 kW).
6) Heat pump with 9 kW auxiliary heater (1-N 4.5 kW).
7) Pressure drop that must not be exceeded outside the heat pump without the nominal flow being reduced. For the cooling circuit these values require a pipe of Ø 40x2.4.
8) Nominal flow: heating circuit Δ10K, cooling circuit Δ3K.
9) Fuse protection phase L1 (size 4 is equipped with an 1-phase compressor)
10) Only DHP-H.
**) Not available in 230V 1-N version.*

Declaration of Conformity/Manufacturer's Declaration
Försäkran om överensstämmelse/Tillverkardeklaration

Directive area. *Direktivets område.*	**Directive no** *Direktiv nr*	**Consolidated Legislation** *Konsoliderad lagstiftning*	**Harmonized Standards applied** *Använda, harmoniserade, standarder*
Safety of machinery *Maskindirektivet*	98/37/EG		EN ISO 12100
Low voltage equipment *Lågspänningsdirektivet*	2006/95/EC		EN 60335-2-40:2003 +A11+A12+A1 EN 60335-1+A1+A11+A12+A2+A13 EN 62233
Electromagnetic compatibility *Elektromagnetisk compatibilitet*	2004/108/EC		EN 55014-1:2006
Pressure equipment *Tryckbärande anordning*	97/23/EC article 3.3		

Manufacturer's name, address, telephone and fax no:
Tillverkarens namn, adress, telefon, telefax:

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Box 950
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Telephone: +46 570 81300, Telefax: +46 570 17616

Brand name or trademark
Fabrikatnamn eller varumärke

Danfoss

Type of equipment
Typ av utrustning

Cooling module 1-phase 230 VAC
Kylmodul 1-fas 230 VAC

Type designation etc.
Typbeteckning etc

Name *Namn*	**Size** *Storlek*	**Technical reports** *Tekniska rapporter*
DCM-PA DCM-P	N/A	Product Risk Analysis Cooling Module 090511

By signing this document, the undersigned declares as manufacturer that the equipment in question complies with the protection requirements of the above directive.

Genom att underteckna detta dokument försäkrar undertecknad såsom tillverkare att angiven utrustning uppfyller skyddskraven i rubricerade direktiv.

Date *Datum*	**Signature** *Underskrift*	**Position** *Befattning*
2009-06-01	Björn Erlingsson	Man. Dir./VD

Clarification
Namnförtydligande
Björn Erlingsson